

**Tackling poverty through private sector microcredit programs  
in Ghana: Does infant and young child nutrition improve?**

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## ABSTRACT

Low income is a barrier to optimal feeding practices of infants and young children (IYC). Microcredit programs for rural Ghanaian women aim to increase incomes, which may improve the quantity and quality of foods given to IYC. This study examined (1) the association between a mother's participation in a microcredit-only program and IYC dietary quality and nutritional status, (2) factors influencing IYC feeding among mothers, and (3) factors influencing the incorporation of nutrition education within a microcredit program. Participants included 102 active microcredit (MC) member mothers and 102 non-microcredit (NMC) member mothers and their youngest child (6-23 mo). Information was collected on IYC feeding practices, length, and weight, and household socio-demographic characteristics. Focus group discussions were conducted with 6 NMC mothers and 15 MC mothers. Individual semi-structured interviews were conducted with 5 staff associated with the MC program. A mother's participation in MC was positively associated with her child meeting minimum dietary diversity recommendations. Compared to the NMC group, IYC in the MC group met this indicator more often and consumed more legumes and nuts, and dairy products ( $p<0.05$ ). There were no differences in nutritional status after adjusting for covariates. NMC mothers cited family as their main influence on IYC feeding practices while MC mothers cited health workers as most influential and reported that loans increased their financial independence but had little to no impact on IYC feeding practices. Barriers to incorporating nutrition education in a MC program included high staff caseload, lack of external training, and low priority status. Private sector activities such as MC may play a role in improving the diet of IYC in Ghana; however, added nutrition education may be necessary to see improvements in child growth. Long-term partnerships between rural banks and nutrition-related organizations are needed to ensure sustainability of education components over time.

## RÉSUMÉ

Un faible revenu est une barrière aux pratiques d'alimentation optimales des nourrissons et jeunes enfants (NJE). Les programmes de microcrédit pour les femmes ghanéennes vivant en milieu rural ont pour objectif d'accroître leur revenu, ce dernier pouvant améliorer la quantité et qualité des aliments offerts aux NJE. Cette étude a examiné (1) l'association entre la participation d'une mère à un programme de microcrédit et la qualité alimentaire et l'état nutritionnel des NJE, (2) les facteurs ayant une influence sur les pratiques d'alimentation des NJE parmi les mères, et (3) les facteurs ayant une influence sur l'incorporation d'activités d'éducation nutritionnelle dans un programme de microcrédit. Des mères membres (MC; n=102) et non-membres (NMC; n=102) d'un programme de microcrédit et leur plus jeune enfant (6-23 mois) ont participé à l'étude. De l'information a été recueillie sur les pratiques d'alimentation des NJE, sur leur taille et leur poids ainsi que sur les caractéristiques sociodémographiques des ménages. Des groupes de discussion ont été menés avec 6 mères NMC et 15 mères MC. Des entrevues semi-structurées ont été menées auprès du personnel associé à un programme de microcrédit (n=5). La participation d'une mère à un programme de microcrédit a été positivement associée aux recommandations minimales de diversification alimentaire chez son enfant. En comparaison au groupe NMC, les NJE du groupe MC ont plus souvent atteint ces recommandations et ont consommé davantage de légumineuses et noix et de produits laitiers ( $p<0.05$ ). Aucune différence dans l'état nutritionnel entre les groupes n'a été trouvée après avoir pris en compte les covariables pertinentes dans l'analyse. Les mères NMC ont cité la famille comme la plus importante influence sur les pratiques d'alimentation de leurs enfants pendant que les mères MC ont cité les professionnels de la santé. Ces dernières ont également rapporté que les prêts ont accru leur indépendance financière mais ont eu peu ou pas d'impact sur les pratiques d'alimentation des leurs enfants. Une clientèle nombreuse, un manque de formation externe, et une faible priorité constituaient les barrières à l'incorporation d'activités d'éducation nutritionnelle dans le programme de microcrédit. Les activités du secteur privé, tel que le microcrédit, peuvent jouer un rôle dans l'amélioration de l'alimentation des NJE au Ghana, par contre l'ajout d'activités d'éducation nutritionnelle pourrait

s'avérer nécessaire pour voir des améliorations dans leur croissance. Des partenariats sur le long-terme entre les banques rurales et des organisations travaillant dans le domaine de la nutrition sont nécessaires pour assurer la viabilité des composantes d'éducation à travers le temps.

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The manuscript included in this thesis was accomplished through collaborative efforts from the co-authors. V. Friesen developed the research questions, wrote the project proposal, and traveled to Ghana (May-August 2011) where she supervised and participated in data collection in the Eastern region of Ghana. This involved developing the field instruments, training local staff to collect data, and assisting in data collection with the help of local interpreters. She also managed and analyzed the data, and wrote the thesis. All of this was accomplished with guidance and support from the co-authors: G. S. Marquis, E. K. Colecraft, and K. Fallon. The data collected for this project were done so solely as part of V. Friesen's thesis.

## TABLE OF CONTENTS

ABSTRACT .....	ii
RÉSUMÉ .....	iii
ACKNOWLEDGEMENTS .....	v
CONTRIBUTION OF AUTHORS .....	vi
TABLE OF CONTENTS .....	vii
LIST OF TABLES .....	xi
LIST OF FIGURES .....	xii
LIST OF ABBREVIATIONS .....	xiii
CHAPTER 1: GENERAL OVERVIEW .....	1
1.1 Introduction .....	1
1.2 Study rationale .....	2
1.3 Overall study aims .....	3
1.4 Specific objectives and hypothesis .....	3
1.4.1 Qualitative research questions .....	4
1.5 Explanation of conceptual framework .....	5
CHAPTER 2: LITERATURE REVIEW .....	7
2.1 Global nutrition situation .....	7
2.1.1 Window of opportunity .....	7
2.1.2 Child nutritional status .....	7
2.1.3 Micronutrient deficiencies .....	8
2.2 Dietary intake of infants and young children .....	9
2.2.1 World Health Organization recommendations .....	9
2.2.1.1 Breastfeeding .....	10
2.2.1.2 Complementary feeding .....	11
2.2.2 World Health Organization infant and young child feeding indicators .....	11
2.3 Nutrition in Ghana .....	12
2.3.1 Child nutritional status in Ghana .....	12
2.3.2 Micronutrient deficiencies in Ghana .....	13
2.3.3 Infant and young child feeding practices in Ghana .....	13
2.4 Determinants of dietary intake .....	15
2.4.1 Feeding frequency and energy density .....	15

2.4.2 Diet quality and diversity .....	16
2.4.3 Maternal education .....	16
2.4.4 Cultural beliefs and practices .....	18
2.4.5 Household income .....	19
2.5 Microcredit programs and better nutrition .....	20
2.5.1 Poverty and nutrition .....	20
2.5.2 Microcredit impacts worldwide .....	20
2.5.2.1 Evidence on poverty and nutrition .....	21
2.5.3 Maximizing the impact of microcredit .....	22
2.5.3.1 Evidence for integrating microcredit with education on child nutrition...	23
2.5.3.2 Challenges of integrated microcredit programs .....	25
2.6 Conclusion .....	26
CHAPTER 3: GENERAL METHODOLOGY .....	28
3.1 Study site.....	28
3.1.1 Microcredit program .....	28
3.2 Study design.....	29
3.3 Quantitative methodology.....	29
3.3.1 Participant inclusion criteria .....	29
3.3.2 Sample size .....	29
3.3.3 Recruitment.....	30
3.3.4 Fieldworker training .....	31
3.3.5 Data collection procedures.....	31
3.3.5.1 Socioeconomic and demographic information .....	32
3.3.5.2 Infant and young child feeding practices .....	32
3.3.5.3 Child anthropometry .....	33
3.3.6 Statistical analysis.....	33
3.3.6.1 Dependent variables.....	33
3.3.6.2 Independent variables .....	34
3.3.6.3 Univariate, bivariate, and regression analysis.....	35
3.4 Qualitative methodology.....	35
3.4.1 Focus group discussions and interviews .....	35
3.4.2 Recruitment and selection criteria .....	36
3.4.3 Fieldworker training .....	36



3.4.4 Procedures for focus groups discussions and interviews .....	37
3.4.5 Qualitative analysis .....	38
3.5 Ethical considerations .....	38
CHAPTER 4: MANUSCRIPT .....	40
4.1 Abstract .....	41
4.2 Introduction .....	42
4.3 Methods .....	44
4.3.1 Study site .....	44
4.3.1.1 Microcredit program .....	44
4.3.3 Quantitative methods .....	45
4.3.3.1 Participants and sampling .....	45
4.3.3.2 Data collection .....	45
4.3.3.2.1 Socioeconomic and demographic information .....	45
4.3.3.2.2 Infant and young child feeding practices .....	46
4.3.3.2.3 Anthropometry .....	47
4.3.3.3 Analysis .....	47
4.3.4 Qualitative methods .....	48
4.3.4.1 Participants and sampling .....	48
4.3.4.2 Focus group discussions .....	48
4.3.4.3 Key informant interviews .....	49
4.3.4.4 Analysis .....	49
4.3.5 Ethical considerations .....	49
4.4 Results .....	50
4.4.1 Quantitative results .....	50
4.4.1.1 Study population .....	50
4.4.1.2 Infant and young child feeding indicators .....	50
4.4.1.3 Independent predictors of feeding indicators .....	51
4.4.1.4 Anthropometry and nutritional status .....	51
4.4.2 Qualitative results .....	52
4.4.2.1 Study population .....	52
4.4.2.2 Major themes related to child feeding practices .....	52
4.4.2.2.1 Influences on infant and young child feeding practices .....	53
4.4.2.2.2 Impact of microcredit loans on mothers and children .....	54

4.4.2.3 Major themes related to nutrition education in microcredit programs .....	54
4.4.2.3.1 Benefits of <i>Credit with Education</i> .....	55
4.4.2.3.2 Facilitators and barriers to nutrition education in a microcredit program .....	55
4.4.2.3.3 Overcoming barriers through permanent partnerships .....	56
4.5 Discussion .....	57
4.5.1 Study limitations .....	65
4.6 Conclusions .....	66
CHAPTER 5: FINAL CONCLUSIONS .....	72
5.1 Recommendations for future research .....	73
CHAPTER 6: REFERENCES .....	74
APPENDICES .....	83
Appendix 1: Informed consent forms .....	83
Appendix 2: Data collection forms .....	90
Appendix 3: Interview procedures and guides.....	97

## LIST OF TABLES

Table 2.1: WHO infant and young child feeding indicators and definitions .....	27
Table 3.1: Participants and duration of focus group discussions and individual interviews .....	39
Table 4.1: Household demographic and socioeconomic characteristics of 204 Ghanaian mothers with infants and young children by microcredit or non-microcredit group .....	67
Table 4.2: Food groups consumed the previous day among 204 Ghanaian infants and young children by microcredit or non-microcredit group.....	68
Table 4.3: Variables associated with WHO infant and young child feeding indicators in 204 Ghanaian infants and young children: Unadjusted and adjusted odds ratios.....	69
Table 4.4: Anthropometric indicators of 204 Ghanaian infants and young children by microcredit or non-microcredit group.....	70
Table 4.5: Multiple linear regression: Variables associated with weight-for-age, length-for-age, and weight-for-length z-scores in 204 Ghanaian infants and young children.....	70
Table 4.6: Multiple logistic regression: Variables associated with risk of underweight, stunting, and wasting in 204 Ghanaian infants and young children .....	71

## LIST OF FIGURES

Figure 1.1 The UNICEF conceptual framework of the determinants of nutritional status of children .....	6
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## **LIST OF ABBREVIATIONS**

aOR	Adjusted odds ratio
ASF	Animal source foods
BCC	Behavior change communication
CI	Confidence interval
cm	Centimeters
DHS	Demographic and Health Survey
FFH	Freedom from Hunger
FGD	Focus group discussions
g	Grams
GHC	Ghanaian Cedis
HAZ	Height-for-age z-score
IYC	Infants and young children
IYCF	Infant and young child feeding
kcal	Kilocalories
kg	Kilograms
kJ	Kilojoules
LAZ	Length-for-age z-score
MC	Microcredit
MDG	Millennium Development Goals
MFI	Microfinance institutions
mo	Months
NMC	Non-microcredit
OR	Odds ratio
PDA	Personal digital assistant
SD	Standard deviation
SE	Standard error
SES	Socioeconomic status
UNICEF	United Nations Children's Fund
USD	United States Dollars

WAZ	Weight-for-age z-score
WHO	World Health Organization
WHZ	Weight-for-height z-score
WLZ	Weight-for-length z-score
y	Years

## **CHAPTER 1: GENERAL OVERVIEW**

### **1.1 Introduction**

Malnutrition is widespread among young children in low-income countries. Globally, an estimated 27% (171 million) of children under five years of age are stunted and 16% (104 million) are underweight with the highest rates occurring among children in Asia and Africa (Lutter et al. 2011). Malnutrition is an immediate result of inadequate dietary intake and poor health status. These two factors are influenced by poverty, food insecurity, poor caregiver knowledge, and lack of access to health services as described by the United Nations Children's Fund (UNICEF) conceptual framework of the determinants of nutritional status of children (Figure 1.1) (Smith & Haddad 2000; UNICEF 1990).

Worldwide commitment in reducing malnutrition is evident with the United Nations Millennium Development Goals (MDG); unfortunately, progress is far below targets in some regions, particularly sub-Saharan Africa (United Nations 2011). Interventions targeting the first two years of life when children are most at risk of malnutrition and growth failure are a priority (Bhutta et al. 2008). Progress has been made to advance breastfeeding knowledge and practices; however, improvements in complementary feeding are still behind (Bhutta et al. 2008). Interventions must address the underlying determinants of nutritional status to effectively reduce malnutrition in the long-term.

Microcredit has been recognized as a strategy for poverty reduction; additionally, its ability to improve the social well-being of clients' families and children has been of equal interest since it began in 1976 (Yunus 2002). A large number of microcredit participants are mothers or caregivers. In recent years, health and nutrition education programs for participants have emerged within microcredit programs in an effort to simultaneously improve child nutrition. However, a better understanding of the relationship between microcredit-only programs and child nutrition outcomes is necessary to be able to distinguish between the differential effects of microcredit and education. Moreover, information regarding the sustainability of nutrition education in

microcredit programs is limited, even though sustainability is essential for the long-term success of such programs.

## **1.2 Study rationale**

Low income and poor maternal knowledge have been identified as barriers to optimal feeding practices of infants and young children (IYC) in Ghana (Colecraft et al. 2006). Microcredit programs for women aim to increase incomes, which may lead to an improvement in the quantity and quality of foods given to IYC. There is clear evidence to support positive financial impacts of microcredit alone (Banerjee et al. 2009; Dupas & Robinson 2009; Karlan & Zinman 2010) and when combined with nutrition education (Homiah et al. 2012) on business investments and outcomes, and household incomes or expenditures. Several researchers have examined the effect of microcredit on child nutrition outcomes. The type of program, either with health and nutrition education (Jacobs & Simler 2007; MKNelly & Dunford 1998; MKNelly & Dunford 1999; Pitt et al. 2003) or without (Doocy et al. 2005; Hazarika & Guha-Khasnobis 2008), and the outcomes measured varied greatly, as did the results. Additionally, programs with education that saw improvements in child nutrition were not able to distinguish whether the causal effect was the microcredit or education due to the combined nature of the programs. There is a dearth of research examining the effect of microcredit programs without education on child nutritional status, particularly during the critical period of complementary feeding. It is important to understand whether an improvement in child nutrition is associated with an increase in income or expenditure from access to credit alone, improvements in maternal knowledge about child feeding alone, or a combination of the two. Examining microcredit programs without nutrition education is therefore necessary to better understand the effect of microcredit alone on child nutrition before including the additional effect of the education. This information will help to inform future microcredit program development on how to structure programs in order to best meet the needs of the populations that they serve.

If nutrition education is included in microcredit programs, it is important to consider who and what influences mothers' IYC feeding practices to ensure lessons are culturally appropriate for the local context. Investigating these influences among mothers



involved in microcredit as well as others in the same communities can help inform future education program design for use in microcredit programs. Long-term incorporation of education programs within microcredit programs can be challenging as the scope is often beyond the financial sector alone and requires input from other organizations in both the public and private sectors (Leatherman et al. 2011). Research is thus needed to examine the facilitators and barriers in incorporating nutrition education associated with microcredit programs and strategies for making it sustainable over time. By investigating the perspectives of staff associated with microcredit programs on these issues, a more local and appropriate viewpoint can be obtained that can help shape recommendations for including nutrition education.

### **1.3 Overall study aims**

The purpose of this study was to determine the association between a mother's participation in a rural bank microcredit-only program in Ghana and the dietary quality and nutritional status of infants and young children. In addition, perceptions regarding factors influencing infant and young child feeding practices among mothers and the incorporation of nutrition education within a microcredit program among staff were also examined.

### **1.4 Specific objectives and hypothesis**

#### *Primary objective:*

1. To compare dietary quality and nutritional status of children 6 to 23 months of age whose mothers were either active microcredit-only members or non-microcredit members.
  - i) It was hypothesized that children whose mothers participated in a microcredit-only program would have increased dietary quality and nutritional status compared to children whose mothers were non-microcredit members.

*Secondary objectives:*

1. To examine the factors influencing infant and young child feeding practices from the perspective of mothers in both microcredit and non-microcredit groups using qualitative methods.
2. To examine the factors influencing the integration and sustainability of nutrition education within a microcredit program from the perspective of staff associated with the microcredit program using qualitative methods.

**1.4.1 Qualitative research questions**

For mothers in microcredit and non-microcredit groups

- a. What information about infant and young child feeding do mothers receive?
- b. What are the main and most trusted sources of infant and young child feeding information and why?
- c. How and what do mothers feed their children and what influences these behaviors?

For mothers in the microcredit group

- d. How does being in a microcredit program affect mothers' incomes and infant and young child feeding practices?
- e. In what other ways has a microcredit program impacted mothers and their children?

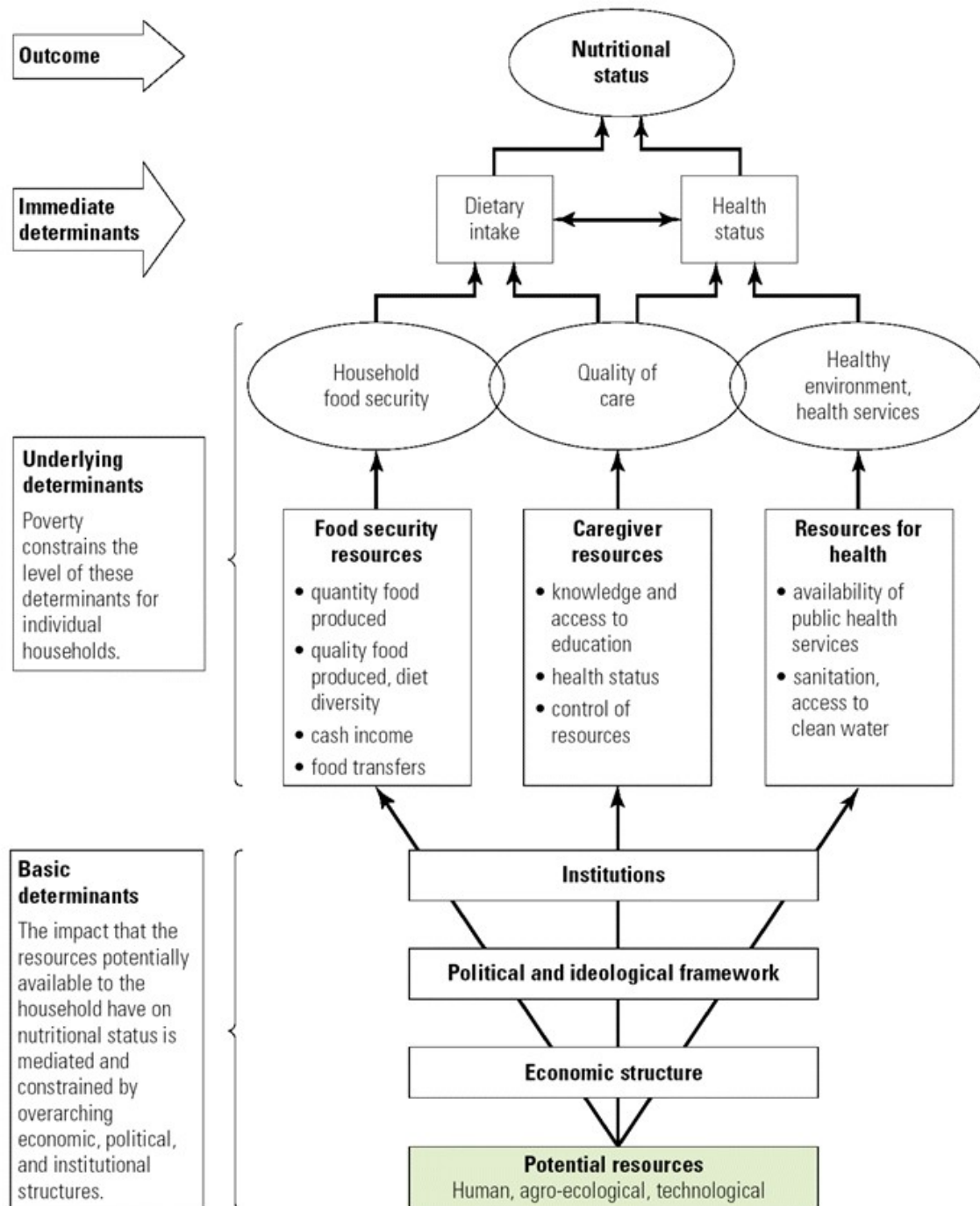
For staff associated with the microcredit program

- f. What are the perceived benefits of providing nutrition education to women in microcredit programs?
- g. What are the perceived facilitators and barriers to integrating nutrition education into microcredit programs?
- h. How can nutrition education be sustained over time in microcredit programs?

### **1.5 Explanation of conceptual framework**

The UNICEF conceptual framework of the determinants of nutritional status of children (Figure 1.1) (Smith & Haddad 2000; UNICEF 1990) demonstrates how a child's nutritional status is an immediate result of both dietary intake and health status. Healthy growth is achieved only when there is household food security in combination with knowledgeable care and adequate health services. It is recognized within the framework that poverty constrains each of these underlying determinants. Furthermore, the human and environmental resources available influence the underlying causes of nutrition, yet are themselves a result of the political expectations and economic structure of society. In addition to examining a mother's participation in microcredit, this study also examined other important variables included in the framework's underlying determinants and their associations with dietary intake and nutritional status of children.

**Figure 1.1 The UNICEF conceptual framework of the determinants of nutritional status of children (Smith & Haddad 2000; UNICEF 1990)**



## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Global nutrition situation**

Undernutrition is a major cause of 35% of deaths in children under five years of age and 11% of the total global disease burden (Black et al. 2008). Poor nutrition early in life can cause substantial damage to growth and cognitive development. As a result, it can have lasting negative consequences for adult health and human capital such as shorter adult height, lower school level attained, reduced adult income, and, for females, lower birth weight in offspring later in life (Victora et al. 2008). Optimal feeding practices during infancy and early childhood are necessary to prevent these adverse consequences and allow children to attain healthy growth and development.

#### **2.1.1 Window of opportunity**

The first 1000 days of life, beginning from conception to a child's second birthday, are vital in establishing a child's future health and prosperity (1000 Days 2011). Growth faltering in children from low- and middle-income countries has been shown to occur mostly between 3 to 18-24 months of age (Shrimpton et al. 2001). Recent analyses of anthropometric data from 54 low- and middle-income countries using the new World Health Organization (WHO) growth standards reaffirmed those results and additionally revealed even more pronounced growth faltering in early childhood (Victora et al. 2010). Children were born with weights and lengths below WHO growth standards and faltering in weight-for-length began as early as one to two months continuing until nine months of age. Beyond two years of age, growth patterns generally stabilized with the exception of weight-for-age, which progressively declined up to five years of age, thus confirming the importance of the first two years of life as a critical period for growth promotion.

#### **2.1.2 Child nutritional status**

Growth is one of the most commonly measured indicators of nutritional status in children. Anthropometric measurements are used to determine the following classifications: wasting ( $<-2$  weight-for-length or weight-for-height z-score (WLZ or WHZ)), stunting ( $<-2$  length-for-age or height-for-age z-score (LAZ or HAZ)) and

underweight ( $<-2$  weight-for-age z-score (WAZ)) (WHO 2006). Wasting is an indicator of acute malnutrition reflecting recent food deprivation and may be due to recent illness or seasonality variations in food availability. Stunting reflects chronic malnutrition due to long-term inadequate dietary intake and is affected by repeated and chronic illness. Underweight is a general indicator of malnutrition, accounting for both acute and chronic malnutrition, and may be the result of stunting or wasting or both. Global estimates in 2010 showed that 27% (171 million) of children under five years of age were stunted and 16% (104 million) were underweight with the highest rates occurring among children in Asia and Africa (Lutter et al. 2011).

### **2.1.3 Micronutrient deficiencies**

Infants and young children in low-income countries experience high rates of micronutrient deficiencies as a result of high requirements relative to body size as well as the poor nutrient composition of typical complementary foods (Lutter & Rivera 2003). Deficiencies can have negative consequences, as adequate intakes of certain micronutrients such as iron, vitamin A, and zinc are essential for proper growth, development, and immune function. Other potential problem nutrients include calcium and vitamin B6, however there is limited biochemical data available for these nutrients (Lutter & Rivera 2003).

Iron is necessary for transportation of oxygen throughout the body and regulation of cell growth and differentiation (Beard 2001). As a result, it is crucial for cognitive development in children and deficiency can lead to impaired mental function (Grantham-McGregor & Ani 2001). Low dietary intake of iron, particularly in high poverty areas, is the major cause of iron deficiency anemia affecting children (Black et al. 2008). Nearly half of preschool children globally have anemia (47%), of which iron deficiency is the cause of an estimated 60% of cases in areas without malaria and 50% in those with malaria (Black et al. 2008). Malaria contributes to the burden of anemia by suppressing hematopoiesis through cytokine-mediation, which further decreases hemoglobin concentration (Biggs & Brown 2001). The highest burden of iron deficiency anemia in children under five years of age is found in South Asia (76%) and sub-Saharan Africa (60%) (Stoltzfus et al. 2004). The prevalence peaks around 18 months, then goes down as

iron requirements decrease and intake of complementary foods containing iron increases (Black et al. 2008). Animal source foods (ASF) such as red meat, fish, and liver are rich in bioavailable iron while plant-based sources contain much smaller, less bioavailable amounts (Stoltzfus & Dreyfuss 1998).

Vitamin A and zinc deficiencies are estimated to have the largest global disease burden of micronutrients, accounting for 0.6 million and 0.4 million deaths, respectively, among children under five years of age (Black et al. 2008). Vitamin A deficiency is a major cause of preventable night blindness, reduced immune function, and increased child mortality from measles and diarrhea (Rice et al. 2004). Preformed vitamin A is found in ASF, such as liver, milk, and egg yolks, while plant source foods, such as dark green, leafy vegetables and orange/yellow non-citrus fruits and vegetables, contain carotenoids (vitamin A precursors) (Maclaren & Frigg 2001).

Zinc is vital for protein synthesis, cellular growth, and cellular differentiation (Caulfield et al. 2006). Deficiency, resulting from inadequate dietary zinc intake, manifests itself as stunting and can lead to immune dysfunction, cognitive impairment, and an increased risk of infectious diseases such as diarrhea, pneumonia, and malaria (Caulfield et al. 2006). Shellfish and other ASF are rich in zinc while only trace amounts are found in plant-based foods; high intakes of fiber and phytates may inhibit zinc absorption (Caulfield et al. 2006).

## **2.2 Dietary intake of infants and young children**

### **2.2.1 World Health Organization recommendations**

The WHO recommends exclusive breastfeeding of infants for the first six months of life with continued breastfeeding up to two years or beyond to achieve optimal health, growth, and development (WHO 2001b). Complementary feeding is the transition period, typically covering the age range of 6-23 months, when other foods and liquids must be added to a child's diet, in addition to breast milk, to meet the changing nutritional needs (PAHO/WHO 2003). Age-specific recommendations are outlined in the *WHO guidelines for complementary feeding of the breastfed child* (PAHO/WHO 2003). Expected daily average energy requirements from complementary foods are determined by subtracting

average breast milk intake from total requirements. For healthy children in low-income countries, total average daily energy needs are 615 kcal at 6-8 months, 686 kcal at 9-11 months, and 894 kcal at 12-23 months of age with complementary foods accounting for 33%, 45%, and 61% for each age group, respectively, and the remainder coming from breast milk (Dewey & Brown 2003).

#### **2.2.1.1 Breastfeeding**

Suboptimum breastfeeding attributes to 10% of the global disease burden and 1.4 million child deaths (Black et al. 2008). Full-term infants of normal birth weight typically have low risk of micronutrient deficiencies during the first six months of life if they are exclusively breastfed and their mothers are well-nourished (Dewey 2005). Low birth weight infants or those born to mothers with prenatal iron deficiency may be at risk of iron deficiency before six months of age and are typically advised to receive iron drops as opposed to introducing complementary foods (Dewey 2005). Similarly, zinc status may be limited among low birth weight infants and zinc supplementation may be recommended (Dewey 2005). If a mother's diet is poor or she is malnourished, certain vitamins (e.g., vitamin A and B vitamins) may be lacking in her breast milk thus putting the child at risk of deficiencies (Dewey 2005). Recommendations suggest improving the mother's diet through food sources or supplements as opposed to giving complementary foods directly to the infant. Finally, infants living in places with little exposure to sunlight may be given vitamin D drops to prevent deficiency (PAHO/WHO 2003).

Breast milk remains as an important source of energy, essential fatty acids, and other nutrients for children, even after the first year of life. In low-income countries, it is estimated that 70% of vitamin A and 31% of calcium are provided by breast milk at 12-23 months of age, assuming average intake; conversely, only 3% of iron, 13% of zinc, and 10% of vitamin B6 are provided (Dewey 2005). Continued breastfeeding is also key in maintaining nutrient intake in children during periods of illness when a child's appetite for other foods may be reduced (Brown et al. 1990).



### **2.2.1.2 Complementary feeding**

Introduction of solid, semi-solid, or soft foods, in addition to breast milk, should begin at six months (PAHO/WHO 2003). Children 6-8 months of age should be fed two to three meals per day, while children 9-23 months of age should be fed three to four meals per day plus additional nutritious snacks once or twice per day according to the child's appetite (PAHO/WHO 2003). These recommendations assume energy density is at least 0.8 kcal per gram. Protein requirements from complementary foods are 2 g per day at 6-8 months increasing to 5-6 g per day at 12-23 months (Dewey & Brown 2003). Optimal lipid intake from complementary foods are less certain for children up to two years of age. Breast milk typically has 30-50% of energy from fat therefore if breast milk intake is high, additional intake required from complementary foods is very little (Dewey & Brown 2003). To consume at least 30% of total energy from fat, the recommendations are as follows when breast milk intake is assumed to be average: no additional fat at 6-8 months (0% of total daily energy intake), 3 g per day at 9-11 months (5-8% of total daily energy intake), and 9-13 g per day at 12-23 months (15-20% of total daily energy intake) (Dewey 2005). Sources of essentially fatty acids such as fish, egg, liver, nut pastes, and vegetable oils are recommended (Dewey 2005). Micronutrients needed from complementary foods vary depending on the amount of each nutrient coming from breast milk. Problem nutrients are those with a high percentage that must be provided by complementary foods and include iron (97-98%), zinc (80-87%), and vitamin B6 (80-90%) (Dewey 2005). Overall, a diet containing adequate amounts of a variety of ASF (such as meat, fish, poultry, or eggs), vitamin A-rich fruits and vegetables, and a sufficient amount of fat is necessary to meet the nutritional needs of infants and young children during the period of complementary feeding (PAHO/WHO 2003). Sufficient intake of problem micronutrients can only be achieved if ASF or fortified foods are consumed (Dewey & Brown 2003); this is often challenging in low-income countries due to the high cost associated with these foods relative to other locally available foods.

### **2.2.2 World Health Organization infant and young child feeding indicators**

In 2008, the WHO developed a set of indicators to assess infant and young child feeding (IYCF) practices worldwide (WHO 2008a). They were developed primarily for

use at the population-level for 1) assessment, 2) identifying risk groups and targeting interventions, and 3) monitoring and evaluation of interventions; however, they can be adapted for use in smaller local or regional settings. Previously, surveys focused mainly on breastfeeding practices according to the *WHO Indicators for assessing breastfeeding practices* published in 1991 (WHO et al. 1991) with very little focus on complementary feeding practices. Timely introduction of complementary foods was the only complementary feeding indicator assessed while no information was collected regarding the quantity or quality of foods.

The revised set of IYCF indicators is comprised of eight core indicators, which include: early initiation of breastfeeding, exclusive breastfeeding under six months, continued breastfeeding at one year, introduction of solid, semi-solid, or soft foods, minimum dietary diversity, minimum meal frequency, minimum acceptable diet, and consumption of iron-rich or iron-fortified foods (Table 2.1). Optional indicators exist, which include: continued breastfeeding at two years, age-appropriate breastfeeding, predominant breastfeeding under six months, duration of breastfeeding, bottle feeding, and milk feeding frequency of non-breastfed children. Other elements, such as responsive feeding and appropriate texture of food, are important aspects of optimal feeding practices but are not yet included as indicators due to the complexity of their measurement.

## **2.3 Nutrition in Ghana**

### **2.3.1 Child nutritional status in Ghana**

In Ghana, wasting and underweight affect 9% and 14% of children under five years of age, respectively, while stunting prevalence is even higher at 28% (GSS et al. 2009). Children 18-23 months of age are at greatest risk as 40% are stunted (GSS et al. 2009). The high prevalence of stunting reflects chronic dietary insufficiencies and is consistent with documented poor feeding practices of Ghanaian children (GSS et al. 2009). Acute and chronic malnutrition are prevalent among young children throughout sub-Saharan Africa. Both underweight and stunting rates in children under five years of age are similar or higher than those seen in Ghana throughout other countries such as

Kenya (17% and 36%, respectively), Mali (28% and 39%, respectively), and Malawi (16% and 53%, respectively) (WHO 2010b).

### **2.3.2 Micronutrient deficiencies in Ghana**

Anemia is the most prevalent and widespread micronutrient deficiency affecting 78% of children under five years of age in Ghana, about half of which is due to iron deficiency (GSS et al. 2009). The prevalence is highest in children 12-17 months of age (88%) (GSS et al. 2009). Inadequate dietary intake of iron is the primary cause of anemia followed by malaria and parasitic infestations (GSS et al. 2009). Recent data show that 75% of children 6-35 months of age consumed foods rich in iron the day preceding the survey and that intake of iron-rich foods increased with age (30% of children 6-8 months of age increasing to 90% in children 24-35 months of age) (GSS et al. 2009). Considering the high prevalence of iron deficiency anemia in young children, quantity of iron-rich foods being consumed appears to be the concern rather than availability.

The estimate of risk of zinc deficiency is based on a country's prevalence of stunting and adequacy of zinc in the food supply. According to estimates from 2004, Ghana was considered a medium risk country for zinc deficiency because although its stunting prevalence was greater than 25% (26%), its estimated prevalence of inadequate zinc intake was less than 25% (21%) (International Zinc Nutrition Consultative Group (IZiNCG) 2004). Dietary intake data from rural Ghanaian children 4-6 years of age showed consumption of low zinc content diets (Ferguson et al. 1993); however, dietary modification strategies such as increasing intake of specific locally available foods and using different food processing techniques may be an acceptable and effective strategy to improve zinc intake (Ferguson et al. 1995). Zinc supplementation among children is rare in Ghana; its only documented distribution was as treatment for diarrhea in children in 2% of diarrheal cases (GSS et al. 2009).

### **2.3.3 Infant and young child feeding practices in Ghana**

Breastfeeding in Ghana is nearly universal (98%); however, only 63% of children are exclusively breastfeeding for the first six months of life (GSS et al. 2009). Additional liquids, porridges, and other solid foods are commonly given to infants early in life.

Aidam et al. assessed factors associated with exclusive breastfeeding in a group of women with infants 0-6 months of age who attended maternal and child health clinics in Ghana (Aidam et al. 2005). A higher likelihood of exclusive breastfeeding for the first six months of an infant's life was associated with delivery at a hospital or clinic (OR 1.96, 95% CI 1.08-3.54), owning their home (OR 3.96, 95% CI 1.02-15.49) and having a positive attitude to exclusively breastfeeding (OR 2.0, 95% CI 1.11-3.57). It is important to note that this study was conducted in a sub-district of the Greater Accra region near the urban capital of Accra and results may differ in more rural areas.

Complementary foods given to infants and young children in sub-Saharan Africa generally consist of watery cereal porridges that are inadequate in energy and nutrient density (Gibson et al. 1998). In Ghana, the first and most common complementary food given to 65% of infants is *koko*, a thin porridge made from fermented maize dough that is low in energy and nutrients (Nti & Larrey 2007). Similar unrefined maize-based porridges in Malawi have been estimated to contain 38-106 kcal/100 g (Gibson et al. 1998). The energy and nutrient composition of these porridges did not consistently meet estimated energy needs and did not meet calcium, iron, and in some cases zinc requirements for infants 9-11 months of age, assuming three feedings of 250 g per day and average breast milk intake (Gibson et al. 1998). Furthermore, foods are often prepared, stored, and fed in unhygienic ways, which contributes to infectious illnesses in infants (PAHO/WHO 2003).

The WHO reanalyzed Demographic and Health Survey (DHS) data collected between 2002 and 2008 from 42 countries and calculated the new IYCF indicators (WHO 2010b). In Ghana, this revealed less than ideal complementary feeding practices as only about half of all Ghanaian children 6-23 months of age met indicators for minimum dietary diversity (47%) and recommended minimum meal frequency (50%; calculated for breastfed children only). Consequently, only 27% of children met the indicator for minimum acceptable diet, which requires having both adequate dietary diversity and meal frequency. Minimum diversity results were lower than previous DHS estimates that were based on an eight food group score for breastfed ( $\geq 3$  food groups; 68%) and non-breastfed children ( $\geq 4$  food groups; 69%) (additional food group was foods made with oil, fat, or butter); meal frequency results were similar (GSS et al. 2009).

## **2.4 Determinants of dietary intake**

Many factors determine the dietary intakes of children including: feeding frequency and energy density, diet quality and diversity, maternal education, cultural beliefs and practices, and household income.

### **2.4.1 Feeding frequency and energy density**

Feeding frequency and energy density of foods are two factors that determine whether or not a child consumes an adequate quantity of foods. This can be challenging due to the limited stomach capacity of children combined with their relatively high-energy needs (Brown et al. 1995). When energy density of complementary foods is low, as is often the case in low-income countries, meals must be provided more frequently throughout the day in order to meet energy requirements (Brown et al. 1995).

In a study in Bangladesh, healthy breastfed children 8-11 months of age were fed porridge with varying energy densities (0.5, 1.0, or 1.5 kcal/g) either 3, 4 or 5 times per day (Islam et al. 2008). The mean amount of foods consumed decreased by 18% when energy density increased from 0.5 to 1.5 kcal/g ( $p<0.001$ ) and conversely increased by 42% when the number of meals per day was raised from 3 to 5 ( $p<0.001$ ). Overall energy intake of foods was positively related to both energy density and feeding frequency ( $p<0.001$  for both). However, breast milk consumption declined by 11% with greater energy density ( $p<0.001$ ) and by 8% with increased feeding frequency ( $p<0.04$ ). Energy density of complementary foods must therefore be recommended with caution in order to avoid displacing breast milk, which may consequently cause a decline in the overall nutritional quality of the diet.

A randomized controlled trial assessed the use of amylase-containing maize-based flours (intervention group) versus similar flour without amylase (control group) prepared as gruels on the energy intake of Congolese infants (Moursi et al. 2003). Distribution of flours began at 18 weeks of age (after infants had already been introduced complementary foods independently) and continued for 14 weeks. Mothers were free to prepare the gruels as they liked therefore median energy densities varied but were 90-110% higher in intervention versus control groups (448-565 kJ/100 g vs. 213-297 kJ/100

g, respectively;  $p < 0.01$ ). Intervention children had a 52% increase in energy intake from gruels at 24 weeks ( $p < 0.02$ ) as a result of the increased energy density; daily breast milk consumption was not different between the groups ( $p = 0.58$ ). This is likely explained by the very low intake of breast milk in this population as a result of early introduction to complementary foods; therefore, in the context of very low breast milk intake, the consumption of high-energy dense complementary foods is not likely to displace breast milk.

#### **2.4.2 Diet quality and diversity**

Appropriate dietary quality is as important as quantity. A recent survey of mothers in the Manya Krobo district of Ghana found that although energy intake of their children 0-18 months of age was relatively high (84-91% of expected intake), diet quality remained poor evidenced by low intakes of calcium (66-78%), iron (33-75%) and B-vitamins (35-60%) relative to expected intakes (Nti & Larrey 2007). Dietary diversity is shown to be correlated with micronutrient density and thus nutritional adequacy of complementary foods (Working Group on Infant and Young Child Feeding Indicators 2006). It is also positively associated with HAZ of children 6-23 months of age in low-income countries, independent of socioeconomic factors such as household income and other confounders (Arimond & Ruel 2004). Similarly, in rural Bangladesh, high dietary diversity scores were associated with reduced risk of stunting in children 6-11 months (OR 0.85, 95% CI 0.76-0.94), 12-23 months (OR 0.74, 95% CI 0.69-0.79) and 24-59 months (OR 0.69, 95% CI 0.66-0.73) (Rah et al. 2010). Previous studies have also shown dietary diversity to be positively associated with socioeconomic status (Hatloy et al. 1998; Torheim et al. 2004). This is an important finding because although a variety of appropriate complementary foods are generally available in most settings, in order to achieve diversification of a child's diet, the household must have adequate income to purchase market foods.

#### **2.4.3 Maternal education**

Mothers are the primary caregivers for their children and are therefore responsible for choosing and offering foods that are appropriate in quality, quantity, and frequency as

well as providing guidance and support during feeding (WHO 2001a). As a result, their knowledge of appropriate feeding practices plays a major role in the nutritional outcomes of infants and young children.

Mothers' formal education has been associated with nutritional status of children in low-income countries (Smith & Haddad 2000). In Nepal, greater than five years of education was shown to be protective against stunting in children 6-36 months of age (OR 0.57, 95% CI 0.37-0.89) (Singh et al. 2009). Furthermore, among Ghanaian mothers with children less than three years of age in Accra, maternal education was positively associated with the following three indices of child care practices: child feeding ( $p<0.05$ ), preventative health seeking ( $p<0.10$ ), and hygiene practices ( $p<0.05$ ) (Armar-Klemesu et al. 2000). Household socioeconomic factors were also found to influence health seeking and hygiene practices whereas child feeding practices were only influenced by maternal education.

Other studies from Ghana suggest that a mother's practical knowledge may be equally or more important than formal schooling (Appoh & Krekling 2005; Ruel et al. 1999). Ruel et al. (1999) demonstrated that good care practices positively impacted child nutrition by alleviating the negative effects of low maternal schooling and poverty. HAZ was approximately one z-score higher (0.97) among children less than three years of age whose mothers had secondary schooling or greater compared to those who had none. However, children whose mothers had secondary schooling or greater had similar HAZ to those of mothers with less than secondary schooling but had good care practices. When comparing low- and high-income terciles along with good care practices, similar results were seen. These results suggest that care practices may be stronger predictors of nutritional status in children than formal schooling among mothers with less education or income. Appoh et al. (2005) examined maternal nutrition knowledge among mother-child pairs where the child was either well-nourished or malnourished in the Volta Region of Ghana based on a score from questions that collected information on maternal attitudes, beliefs, and practices associated with child nutritional status. Maternal nutrition knowledge was found to be positively associated with child nutritional status (OR 2.04, 95% CI 1.39-3.02), independent of marital status, socioeconomic status, and maternal education. Having no formal education was negatively associated with child nutritional

status in bivariate analyses, however after adjusting for the same variables and maternal nutrition knowledge, the relationship was not significant (OR 0.31, 95% CI 0.09-1.20). These results support the promotion of nutrition education messages as an effective strategy to improve child malnutrition among mothers with low levels of education.

#### **2.4.4 Cultural beliefs and practices**

Cultural influences related to taboos, beliefs, and household food allocation practices have been shown to impact children's dietary intake. Many beliefs surrounding the provision of micronutrient-rich ASF to children exist in Ghana. These foods are not given to children in some communities because of beliefs that they will begin to like the taste and turn to stealing in order to obtain them (Armar-Klemesu 2000). Additionally, some caregivers do not give them to their children at all because they are afraid that they will not be able to afford to continue providing them regularly (Colecraft et al. 2004). A participatory rapid appraisal study in Ghana found that traditional food allocation practices in the household often favored older age groups making it difficult for young children to receive these nutrient-rich foods (Colecraft et al. 2006).

Family members, particularly grandmothers, play a large role in influencing child feeding practices of young mothers in many cultures. In Malawi, grandmothers are often the key decision makers regarding when and what types of complementary foods should be introduced into a child's diet (Bezner Kerr et al. 2008). This may have negative consequences as 65% of children in Malawi are given food by one month of age, most often water, herbal infusions, and porridge, of which the latter two have been associated with poor growth (Bezner Kerr et al. 2008). Similar family influences were seen in Ghana. In a qualitative study that examined the perceived incentives and barriers to exclusive breastfeeding, some mothers expressed fear that the grandmother would give infants water or other foods before six months of age in their absence because they believe in traditional feeding methods and are unfamiliar with exclusive breastfeeding (Otoo et al. 2009).



#### 2.4.5 Household income

Greater household income is believed to improve food availability, living conditions, and access to health services, ultimately resulting in improved health and nutritional status of children. In general, as per capita income increases, the number of foods consumed increases and the percentage of expenditure decreases (Falkinger & Zweimüller 1996). Conversely, poorer households are forced to spend a greater percentage of their incomes on staple foods of limited variety. This has been observed in low-income countries; as households gain additional income, they often use it to purchase non-staple food items, such as fruits and vegetables (Ruel et al. 2005), and meat and milk (Delgado 2003) resulting in increased dietary diversity. It is important to note that these results are relevant at the household level only and do not provide information on the dietary intakes of children. Nonetheless, household monthly per capita expenditure was positively associated with the dietary diversity score of children 6-23 months of age in Bangladesh ( $p<0.05$ ) (Rah et al. 2010) suggesting that an improvement in dietary diversity at the household level may be sufficient to improve the diet of young children.

The effect of economic inequality on stunting in children in low-income countries has been shown in several studies (Hong 2007; Hong et al. 2006a; Hong & Mishra 2006b; Woelk & Chikuse 2000). Results from Ghana revealed that stunting was more than twice as likely in children 0-59 months from the poorest 20% of households compared to the richest 20% of household (OR 2.3, 95% CI 1.4-3.7) (Hong 2007). Conversely, differences between stunted and well-nourished children 6-23 months of age were examined in a case-control study in Mexico. The study found that lower per capita family income (below \$25 per month) was a predictor of stunting in urban areas (OR 1.65, 95% CI 1.03-2.64) where family incomes were lower among cases than controls ( $p<0.05$ ) but not in rural areas where family incomes were not significantly different between groups. These findings highlight the importance of examining environmental differences as factors influencing child nutritional status may differ drastically between urban and rural settings.

## **2.5 Microcredit programs and better nutrition**

### **2.5.1 Poverty and nutrition**

The relationship between poverty and poor nutrition is complex as they are interdependent yet influenced by additional underlying factors such as access to food, education, and health services as previously described in the UNICEF conceptual framework (Figure 1.1). The overlap of these factors has also been acknowledged in the United Nations MDG of which, the first goal is to eradicate extreme poverty and hunger (United Nations 2011). Estimates from the latest report in 2011 suggest that this goal will be met by 2015, by reaching a global poverty rate less than 15%, below the target of 23% (United Nations 2011). However, the progress thus far has been mainly a result of substantial growth in Eastern Asia, particularly China. In sub-Saharan Africa, reductions in poverty have been slower and there is much progress yet to be made. Although the proportion of people in the region living on less than \$1.25 a day has dropped from 57% in 1990 to 48% in 2008, poverty still affects a substantial proportion of the population (The World Bank Group 2012). Projections estimate this level will reach below 36% by 2015 (United Nations 2011).

### **2.5.2 Microcredit impacts worldwide**

Microcredit programs are recognized as a strategy for poverty reduction. Microfinance institutions (MFI) provide small microcredit loans and financial services to groups of poor people, mainly women. The group model allows members to act as social collateral for one another as opposed to providing traditional physical collateral, which most of these clients do not have. Providing poor people with loans can alleviate poverty by creating opportunities to invest in small businesses, which can in turn increase the standard of living for their families (Yunus 2002). As of December 2007, over 155 million people throughout the world received microcredit and financial services from over 3,500 MFI (Daley-Harris 2009). In sub-Saharan Africa alone, there were nearly 1000 MFI that provided services to more than 8 million people (Daley-Harris 2009).

Of the 107 million microcredit clients who are considered extremely poor according to the MDG definition, 83% (88.7 million) are women (Daley-Harris 2009).

Women have demonstrated higher repayment performance and may have greater household impacts than men (Khandker 2005); although evidence of the level of impact on per capita household expenditures may be weaker than previously thought (Roodman & Morduch 2009). Microcredit thus provides an additional opportunity to promote gender equality and empower women (Armendariz & Morduch 2005), which may result in improved social well-being on top of improved financial outcomes. There has been international recognition of these added social benefits; Muhammad Yunus and the Grameen Bank in Bangladesh, where microcredit originated (Wahid & Hsu 2000), received the 2006 Nobel Peace Prize in acknowledgment of the ability of microcredit to effect social change.

#### **2.5.2.1 Evidence on poverty and nutrition**

Many studies have demonstrated the effectiveness of microcredit programs on reducing poverty (Goldberg 2005); however, rigorous evidence supporting its impact on financial and social well-being is not as well documented. In the few randomized controlled trials that do exist (Banerjee et al. 2009; Dupas & Robinson 2009; Karlan & Zinman 2010), positive impacts were seen on financial investment and outcomes while no impact was seen on poverty and social well-being such as women's empowerment, child school enrollment, or overall health (Odell 2010). This may be due to the long-term evaluation needed to see effects on poverty and health, as they are slower to develop, whereas these studies were relatively short-term (15-18 months). Other studies suggest that microcredit programs may actually have negative financial impacts on some clients by creating a cycle of debt where subsequent loans are taken to pay off past loans (Rahman 1999; Snow & Buss 2001).

Few studies have examined nutritional outcomes as a result of participation in a microcredit-only program that was not combined with a health promotion or education intervention. Of those that did, the results are mixed. In Peru, a microcredit program was associated with lower food insecurity ( $p < 0.01$ ) and higher hemoglobin levels ( $p < 0.04$ ) but not body mass index among a large sample of adult female participants (Hamad & Fernald 2010). A study in Ethiopia found increased risk of malnutrition (mid upper arm circumference (MUAC)  $< 22.0$  cm) among female controls compared to participants of a

microcredit program (OR 3.2, 95% CI 1.1-9.8); although there was only a tendency for prevalence of malnutrition to be higher among controls than participants (8.3% vs. 1.6%, respectively;  $p=0.089$ ) (Doocy et al. 2005). No differences between groups were seen regarding malnutrition among male participants (MUAC <23.0 cm) or wasting in children 6-59 months of age (MUAC <12.5 cm or the presence of pedal edema). Male participation in microcredit was positively associated with wasting in children (OR 1.6, 95% CI 0.78-3.32) suggesting that female participation in microcredit was a predictor of child nutritional status; however, results were not statistically significant. Women's access to microcredit in Malawi resulted in improved nutritional status (HAZ) ( $p<0.01$ ) of female children 0-6 years of age but not male children, while men's access to microcredit did not have an effect on either sex (Hazarika & Guha-Khasnobis 2008). Positive benefits of female participation in microcredit may be explained by greater access to and control over household resources of women borrowers. Since microcredit alone does not impart health/nutrition knowledge or communicate behavior change, the effects on health and nutrition are indirect; therefore, it is not surprising that studies evaluating microcredit-only programs have not seen consistent significant benefits. Furthermore, in the two studies that examined children's nutritional status, only anthropometry was evaluated; expanding this to include children's dietary quality and feeding practices may provide greater insight regarding the effects of microcredit on child nutrition.

### **2.5.3 Maximizing the impact of microcredit**

Current evidence from a recent review of microfinance suggests that coupling financial interventions with training and health services may be more influential on outcomes related to health than microfinance alone (Karlan & Morduch 2010). Providing only financial services can be described as a “minimalist” approach to the multifaceted poverty issue. Microcredit clients often live in isolated areas with limited access to health promotion efforts from different agencies and services (Daley-Harris 2009). Microcredit programs that have the capacity to reach these vulnerable populations are therefore well positioned to employ health and education programs that are able to address the underlying causes of poverty and poor nutrition. Furthermore, the group based nature of

microcredit and the regularity of its meetings provides an effective venue for providing low cost adult education services to those in need (Dunford 2001). Ignoring the health of clients may actually negate poverty reduction and increase loan defaults as repayment rates have been shown to decline with poor client health (Noble 2001).

### **2.5.3.1 Evidence for integrating microcredit with education on child nutrition**

The literature evaluating the impact of microcredit programs with a health/nutrition intervention on child nutrition outcomes is limited. Four studies available from Bolivia, Ghana, and Bangladesh were found and are reviewed here.

In Bolivia and Ghana, Freedom from Hunger (FFH) conducted an evaluation of its *Credit with Education* program on child nutrition. FFH is an international non-governmental organization that works in 20 countries throughout the world to help families suffering from chronic hunger and poverty. Their *Credit with Education* programs provides training to MFI on how to integrate microcredit loans with education on health and nutrition, and business skills for rural women (Freedom from Hunger 2012). Health and nutrition education topics include: diarrhea management, breastfeeding, infant and child feeding, immunization, and family planning.

The program in Bolivia was evaluated using a cluster-randomized study (McNelly & Dunford 1999). Microcredit participants were compared to controls (non-participants from the same communities and from different communities). No differences were seen between groups for WAZ, LAZ, or WLZ among children 11-26 months of age. The quality of the education received was ranked as those receiving “worst,” “average,” and “best” education due to implementation problems from lack of supervision and training, and high turnover of field officers. Among children receiving the “worst” education, a significant decline in WAZ was seen from baseline to follow-up ( $p<0.05$ ). Timely introduction of solid foods when the child was six months was reported more often among participants than both control groups ( $p<0.05$ ) while feeding frequency did not differ. Total per capita food expenditure and food insecurity did not change, however per capita food expenditure on meat and fish increased in participants and controls from the same communities by 28% and 140%, respectively. Women’s monthly income did not increase from baseline to follow up, but was significantly higher than that of controls

from different communities; however, explanation of how expenditures were determined is unclear.

In Ghana, a similar evaluation was conducted (MkNelly & Dunford 1998). An improvement in LAZ of children 12-24 months of age was observed from baseline to follow up in microcredit families (0.33), while during that same time LAZ declined among children of controls from different communities (-0.20) ( $p$  for difference = 0.04). Mean WAZ changes were similar: children in microcredit families improved (0.2) while those of controls from different communities declined (-0.20) ( $p$  for difference = 0.04). Household food security was significantly higher among participants compared to both control groups ( $p < 0.05$ ). Participants also had a greater increase in a breastfeeding score (based on five ideal behaviors) over time versus both control groups. Additionally, feeding frequency increased more over time among participants ( $p < 0.05$ ), as did consumption of meat, fish, and eggs ( $p = 0.06$ ) than both control groups. Women's reported income and total household food expenditure increased more among participants versus both control groups; however, explanation of how expenditures were determined is unclear. In both studies, maternal knowledge was assessed at follow-up and no impact was seen regarding child feeding practices with the exception of participants in Bolivia who were more likely to know to keep food clean and covered to prevent diarrhea.

In Bangladesh, three microcredit programs that were combined with education on skill development training, literacy, investment strategies, health, and schooling were evaluated and found that only female borrowing had a significant impact on child anthropometry, and total household food and nonfood expenditure, while no impact was seen with male credit (Khandker 2005; Pitt et al. 2003). These findings support other studies that demonstrated that women are more likely to spend more money on food for their children and other household goods than men (Quisumbing et al. 1995). The positive outcomes seen only among women, who make up the majority of microcredit participants worldwide, provide evidence that microcredit with education may help promote gender equality by creating opportunities for women to increase their influence in the household and on their children's well being.

In Northern Ghana, diets of children less than 36 months of age were examined as the outcome of three interventions: a behavior change and communication (BCC)

intervention focused on breastfeeding and complementary feeding combined with either a microcredit program with education on nutrition and sanitation or a food-based intervention promoting vitamin A-rich foods (groups were not mutually exclusive, i.e., some communities received both microcredit and the food-based intervention) (Jacobs & Simler 2007). Of the three intervention groups, only microcredit with BCC had a significant impact on children's diets; children consumed vitamin A-rich foods including red palm oil and dark green leafy vegetables more frequently and their total intake of vitamin A was higher compared to other groups. The study design had limitations, as there was a lack of baseline data to provide evidence that the groups were similar at the start making the results unclear.

Overall, there is evidence to suggest child nutrition status, food availability, and diet quality as well as household food expenditures can be improved through an integrated microcredit and education program targeted at women. However, there is a lack of rigorous evaluation that is needed to confirm these relationships. Furthermore, evidence on the quality, intensity, and frequency of exposure to education components and actual ability to improve maternal knowledge and child feeding practices is limited. This is critical, as the quality of education received by participants may greatly influence the extent of behavior change that occurs. It is also important to consider selection bias when examining the effects of these programs compared to a control group of non-participants as women self-select to be in microcredit and may therefore be inherently different than those who do not.

#### **2.5.3.2 Challenges of integrated microcredit programs**

Integration of education programs within microcredit programs remains a challenge as the scope is often beyond the financial sector alone and requires input from other organizations in both the public and private sectors (Leatherman et al. 2011). There is also pressure for MFI to become financially sustainable and therefore the cost associated with adding non-financial services such as education may be a barrier to providing integrated services (Pronyk et al. 2007). Moreover, there is no optimal framework or program design available to aid in the sustainability of such programs within existing microcredit organizations. Thus rigorous research is needed focusing, not

only on health and nutrition outcomes of microcredit programs as stated previously, but also on how to effectively partner with other organizations that can provide public health expertise and program delivery strategies.

## **2.6 Conclusion**

It is well documented that malnutrition among children in low-income countries, particularly during the first two years of life, is a major concern and is directly related to inadequate dietary intake and poor health status. Microcredit programs are one entry point for connecting economic development with health and nutrition outcomes, as a means of targeting multiple underlying determinants of nutritional status. Research evaluating microcredit-only programs on child nutrition outcomes is scarce with mixed results, while there is some evidence to suggest positive effects from integrated microcredit and education programs. Further rigorous research is needed examining the various types of programs to develop recommendations for cost-effective program design that can be scaled up and replicated worldwide. Microcredit programs in sub-Saharan Africa have great potential for improving progress toward the MDG by tackling poverty and reducing child malnutrition. This research project aims to fill the knowledge gap by evaluating a microcredit-only program in Ghana on child nutrition outcomes, and also examining the challenges of integrating nutrition education into microcredit programs and possible strategies to overcome them.



**Table 2.1: WHO infant and young child feeding indicators and definitions**

<b>WHO IYCF indicator</b>	<b>Definition of indicator</b>
1. Early initiation of breastfeeding	% of children born in the last 23.9 mo who were put to the breast within one hour of birth
2. Exclusive breastfeeding under 6 months	% of infants 0-5.9 mo fed exclusively with breast milk (the previous day)
3. Continued breastfeeding at 1 year	% of children 12.0-15.9 mo who were fed breast milk (the previous day)
4. Introduction of solid, semi-solid, or soft foods	% of infants 6.0-8.9 mo who received solid, semi-solid, or soft foods (the previous day)
5. Minimum dietary diversity	% of children 6.0-23.9 mo who received foods from $\geq 4$ food groups (the previous day) <sup>1</sup>
6. Minimum meal frequency	% of children 6.0-23.9 mo who received solid, semi-solid, or soft foods the minimum number of times or more (the previous day) <sup>2</sup>
7. Minimum acceptable diet	% of children 6.0-23.9 mo who received a minimum acceptable diet, apart from breast milk (the previous day) <sup>3</sup>
8. Consumption of iron-rich or iron-fortified foods	% of children 6.0-23.9 mo who received an iron-rich or iron-fortified food specially designed for infants and young children, or is fortified in the home (the previous day)

WHO, World Health Organization; IYCF, Infant and young child feeding; <sup>1</sup>Food groups are: grains, roots, and tubers; legumes and nuts; dairy products; flesh foods; eggs; vitamin-A rich fruits and vegetables; and other fruits and vegetables. <sup>2</sup>Minimum number of times is 2 times for breastfed infants 6.0-8.9 mo; 3 times for breastfed children 9.0-23.9 mo; and 4 times for non-breastfed children 6.0-23.9 mo. <sup>3</sup>These are the children who met both minimum dietary diversity and meal frequency indicators.

## CHAPTER 3: GENERAL METHODOLOGY

The present study consisted of collection and analysis of quantitative and qualitative data. The data collection period lasted three months, from June to August 2011.

### 3.1 Study site

The research was conducted in a primarily rural district in the Eastern region of Ghana. The Eastern region is the third most populous region in Ghana; it is home to over 2.5 million people, representing 11% of the total population of the country (GSS 2011). In the region, rates of wasting and underweight among children under five years of age are slightly lower than national averages (6% vs. 9% and 9% vs. 14%, respectively) (GSS et al. 2009). However, the rate of stunting is 10% higher than the national average (38% vs. 28%), reflecting chronic dietary insufficiencies (GSS et al. 2009). Anemia is prevalent and widespread throughout the region affecting almost three in four children under the age of five years (GSS et al. 2009).

#### 3.1.1 Microcredit program

A rural bank located in the capital of the district runs a microcredit program. It began in July 2001 with Plan Ghana and Freedom from Hunger (FFH) as partners. Plan Ghana, an international development organization that aims to promote child rights in an effort to end poverty, provided the initial credit funds. FFH provided the technical support to implement their *Credit with Education* methodology (Freedom from Hunger 2012). Bank staff received training on how to run a microcredit program that combined providing credit and delivering education lessons on basic health and nutrition, and business skills for rural women. The partnership lasted three years until the bank became self-sustainable in running the program. The bank continued to follow the *Credit with Education* methodology until 2007, at which time they discontinued the education component of the program and have since only provided credit to participants.

### 3.2 Study design

This was a mixed methods cross-sectional study examining the association between a mother's participation in a rural bank microcredit program and the dietary quality and nutritional status of infants and young children. Two groups of mother-child pairs, one where the mother was an active microcredit member and one where the mother was a non-microcredit member, were compared in terms of dietary quality and nutritional status of the child. Additionally, perceptions regarding factors influencing IYCF practices among mothers and the incorporation of nutrition education within a microcredit program among staff were examined using qualitative methods.

### 3.3 Quantitative methodology

#### 3.3.1 Participant inclusion criteria

*Inclusion criteria for the mothers:*

- 1) Must be at least 18 years of age;
- 2) Must have a child between 6 and 23 months of age;
- 3) Must be either an active microcredit member at the rural bank or not involved in any microcredit program currently or in the past.

#### 3.3.2 Sample size

The sample size calculation was made using the following formula (Hulley 2007):

$$N = (z_{\alpha} \sqrt{[P(1 - P)(1/q_1 + 1/q_2)]} + z_{\beta} \sqrt{[P_1(1 - P_1)(1/q_1) + P_2(1 - P_2)(1/q_2)]})^2 \div (P_1 - P_2)^2$$

Where: N = the total number of participants

$P_1$  = proportion of participants in the microcredit group who meet minimum meal frequency recommendations

$P_2$  = proportion of participants in the non-microcredit group who meet minimum meal frequency recommendations

$q_1$  = proportion of participants in the microcredit group

$q_2$  = proportion of participants in the non-microcredit group

$$P = q_1 P_1 + q_2 P_2$$

$z_{\alpha}$  = the standard normal deviate for  $\alpha$

$z_{\beta}$  = the standard normal deviate for  $\beta$

*Assumptions:* 2-sided test, equal proportion of participants,  $z_{\alpha}= 1.96$ ,  $z_{\beta} = 0.84$

*Desired precision:* 2-sided alpha ( $\alpha$ ) of 0.05

*Desired power:* 0.80, therefore a beta ( $\beta$ ) of 0.20

*Primary objective:* To determine the association between a mother's participation in a microcredit program and dietary quality of children 6 to 23 months of age.

*Outcome variable:* Differences in dietary quality expressed by the proportion of children meeting meal frequency recommendations between groups. (This outcome was chosen because there were no previous studies examining microcredit programs on other indicators of dietary quality such as minimum dietary diversity or minimum acceptable diet).

According to the 2008 DHS, 50% of children 6 to 23 months of age in Ghana met minimum meal frequency recommendations (GSS et al. 2009). There were no previous studies that analyzed the association between a mother's participation in a microcredit-only program and child minimum meal frequency. However, a study evaluating a combined microcredit and nutrition education program in Ghana found a 20% increase in mean feeding frequency (means times eaten in past 24 hours) of children 8 to 36 months of age of microcredit participants compared to those of controls (4.8 vs. 4.0;  $p=0.03$ ) (MkNelly & Dunford 1998); therefore, an expected increase in meeting meal frequency recommendations in the microcredit group of 0.20 was used in the calculation.

**N = 186** or 93 in each group

### **3.3.3 Recruitment**

Mothers who met the inclusion criteria for the microcredit group were recruited during or immediately following microcredit meetings and invited to participate in the

study. The bank had a total of 91 microcredit groups in 44 communities throughout the district. All microcredit groups in the district capital (the urban sub-district) were sampled ( $n=16$ ). Recruitment then expanded to other communities in the district to obtain the needed sample size. Bank staff identified groups with women who had young children that were accessible from the district capital by proximity and timing of meetings. A convenience sample was taken which included 17 additional microcredit groups in 10 other communities throughout the district. In total, recruitment represented 36% of all microcredit groups and 20% of all communities with microcredit groups in the district.

Following enrollment of mother-child pairs in the microcredit group, mother-child pairs in the non-microcredit group were recruited using systematic sampling matching by community and child age. A household closest to where the microcredit meeting took place was randomly selected in each community and alternate households were sampled. Those with mothers who met the criteria were invited to participate in the study.

### **3.3.4 Fieldworker training**

The two fieldworkers had completed high school education, were familiar with the local communities, and were fluent in the local language, *Krobo*, as well as English. They were trained for two weeks on the specific data collection methods and the importance of confidentiality.

### **3.3.5 Data collection procedures**

Before data collection commenced, data collection tools were reviewed and pretested in adjacent communities. For participants in the microcredit group, data collection occurred either during or following a microcredit group meeting at the location in the community where the group regularly met. For participants in the non-microcredit group, data collection took place at the participants' homes. Informed and written consent for participant involvement was obtained from the mother for both her and her child. Women who were not able to sign their name provided a thumbprint. Study participants provided consent for all photographs used in research presentations.

Participants responded to an interviewer-administered questionnaire and responses were recorded on paper (55%, n=113) or using a personal digital assistant (PDA) (45%, n=91) (see Appendix 2 for complete list of questions). All questionnaires were field checked by the researcher. The use of PDAs prevented input errors in the field by providing immediate checks after each question to ensure questions were not missed and responses were within valid ranges. It also eliminated manual data entry as data entered into the PDAs were uploaded directly into a spreadsheet in Microsoft Access 2007. Due to programming delays, PDAs were not introduced into the field until the second week of July; interviews that occurred prior were done on paper questionnaires that were then entered into a PDA and uploaded.

#### **3.3.5.1 Socioeconomic and demographic information**

Mothers provided information on their age, number of live births, level of education reached, marital status, and primary occupation. Household information on number of people living in the household, number of rooms, housing materials, weekly food expenditure, primary source of water, access to electricity, and energy source for cooking was also collected. Additionally, mothers in the microcredit group provided information on the number of loan cycles completed, total amount of loans received, use of loans, and how loans changed their income and child's diet. Mothers in the non-microcredit group provided information on whether they knew about microcredit and why they did not participate in it.

#### **3.3.5.2 Infant and young child feeding practices**

A list-based dietary recall derived from the WHO indicators for assessing IYCF practices was used to collect information on the child's intake of breast milk, liquids other than breast milk, and solid, semi-solid, or soft foods as well as the number of times foods were consumed the previous day (Appendix 2, Section E) (WHO 2008a; WHO 2010a).

### **3.3.5.3 Child anthropometry**

Mothers reported the child's sex, birth date, and age in months. The birth date was confirmed using the child's growth monitoring card, when possible. An exact age in months was calculated using WHO Anthro software, version 3.2.2 (WHO 2011). Length and weight measurements were taken in duplicate using standardized WHO techniques to ensure quality control (WHO 2008b) and the average values were used for analysis. The child's length was measured to the nearest 0.1 cm using a length board with the child recumbent without shoes or socks. The child was weighed in minimal clothing using a digital scale (Tanita, Arlington Heights, IL). The mother stood on the scale without shoes until her weight was displayed, the scale was then tared to 0.0, and the child was handed to the mother. The child's weight appeared on the scale and was recorded to the nearest 0.1 kg.

### **3.3.6 Statistical analysis**

#### **3.3.6.1 Dependent variables**

The primary dependent variables examined were the child's feeding practices as assessed by the six age-appropriate WHO core indicators for IYCF. Secondary dependent variables examined included anthropometric indicators.

*IYCF indicators:* The list-based dietary recall was used to assess the following IYCF indicators: 1) continued breastfeeding at 1 year (children 12.0-15.9 months of age), 2) introduction of solid, semi-solid, or soft foods (children 6.0-8.9 months of age), 3) minimum dietary diversity, 4) minimum meal frequency, 5) minimum acceptable diet, and 6) consumption of iron-rich or iron-fortified foods (WHO 2008a; WHO 2010a). Dietary diversity was calculated by coding items in the list-based recall into the seven specific food groups outlined by WHO and summing the total number of food groups consumed by each child. A score of  $\geq 4$  food groups indicated a minimum dietary diversity. Minimum meal frequency was determined by comparing the reported number of times a child received solid, semi-solid, or soft foods to the age-specific recommendation as per the child's breastfeeding status. Minimum number of times was:

two times for breastfed infants 6.0-8.9 months, three times for breastfed children 9.0-23.9 months, and four times for non-breastfed children 6.0-23.9 months. Minimum acceptable diet was defined as meeting both minimum dietary diversity and minimum meal frequency indicators. For breastfed children, these two indicators were determined as previously described. For non-breastfed children, minimum dietary diversity was defined as a score of  $\geq 4$  food groups based on a six food group score (excluding dairy products) and minimum meal frequency was determined as previously described but also required the child to have received a minimum of two milk feeds.

*Anthropometric indicators:* Child length and weight data were used to compute WAZ, LAZ, and WLZ using WHO Anthro software, version 3.2.2 (WHO 2011). Z-scores were initially analyzed as continuous data and then transformed into categorical data using the following classifications: underweight if WAZ was less than -2, stunted if LAZ was less than -2, and wasted if WLZ was less than -2.

### **3.3.6.2 Independent variables**

The primary independent variable was whether or not the mother was in the microcredit program. Other independent variables considered in the statistical analysis were based on the *a priori* conceptual framework and published literature. These included socioeconomic and demographic factors including household information (number of people living in the household, number of rooms, weekly food expenditure, material of wall, floor, and roof, primary source of drinking water, access to electricity), maternal characteristics (age, parity, level of education reached, marital status, primary occupation) and child characteristics (age, sex). Socioeconomic status (SES) was represented by a composite variable of housing materials (wall, floor, and roof), source of drinking water, and access to electricity. The score ranged from 1-5 points and was categorized into low (1-2 points) and high (3-5 points) after examining the univariate distribution.



### **3.3.6.3 Univariate, bivariate, and regression analysis**

Descriptive analyses were used to determine means, ranges, and measures of dispersion of all measured variables. Means and standard deviations were generated for continuous variables and frequency distributions, and percentages were generated for categorical variables. Bivariate tests between dependent and independent variables were performed. Normally distributed continuous variables were tested using independent Student's t-test and Analysis of Variance. The non-parametric Mann-Whitney Wilcoxon test was used to test for non-normally distributed continuous data. For categorical variables, Chi-square (or Fisher's exact test where applicable) was used.

Multiple logistic regression analysis was used for categorical dependent variables (IYCF indicators and anthropometric classifications) and multiple linear regression analysis was used for continuous dependent variables (WAZ, LAZ, and WLZ). In both types of regression modeling, independent variables were included if they had been statistically significant or approached significance ( $p \leq 0.25$ ) in bivariate analyses or identified in the *a priori* conceptual framework and published literature. Backward elimination was done to remove non-significant variables one at a time until only variables with  $p \leq 0.1$  remained. All models were tested for multicollinearity by examining variance inflation factors. Dummy variables for individual communities and for urban (district capital) or rural (all others) communities were created and tested in all models, but were not found to be significant. No outliers were discarded from the analyses. All data were analyzed using SAS software, version 9.2 (SAS Institute Inc. 2008). Results were reported at a 0.05 significance level.

## **3.4 Qualitative methodology**

### **3.4.1 Focus group discussions and interviews**

Focus group discussions (FGD) were conducted with mothers in both microcredit and non-microcredit groups and examined factors influencing IYCF practices. Focus groups typically involve 6 to 10 participants from a similar background and involve open-ended questions on specific issues lasting between 1 to 2 hours (Patton 2002). This

social context provides a rich data source, as participants are not only able to consider their own views but can also respond to and reflect on the views of others.

Key informant interviews were conducted with staff associated with the microcredit program and examined barriers and facilitators to incorporating nutrition education sustainably in microcredit programs. Key informants are individuals who are particularly knowledgeable about the setting and whose insights may be useful in understanding what is happening and why (Patton 2002).

### **3.4.2 Recruitment and selection criteria**

Two microcredit groups were purposely selected to participate in FGD: one from the district capital (urban) and one from the surrounding study communities (rural). Mothers who were already enrolled in the study were invited during microcredit group meetings to participate in the group discussions. Additionally, one study community (rural) was selected and all mothers who were enrolled in the non-microcredit group in that community were invited to participate in the FGD. Due to time limitations, a FGD with mothers in the non-microcredit group from the district capital (urban) was not possible.

Purposeful sampling was also used to recruit key informants for interviews. One supervisor and two field officers associated with the microcredit program at the rural bank and one staff member from FFH Ghana were invited and agreed to participate. A microcredit project coordinator from a rural bank in a nearby district who had previously been trained by FFH was identified by the FFH staff member and invited and agreed to participate.

### **3.4.3 Fieldworker training**

The two fieldworkers hired for the quantitative data collection were also involved in qualitative data collection during the FGD. The fieldworkers completed one additional week of training on how to ask interview questions, probe, and transcribe audio-recordings prior to beginning qualitative data collection.

#### **3.4.4 Procedures for focus groups discussions and interviews**

The focus groups involved six to nine women each and lasted approximately one hour (Table 3.1). They were conducted in the local language by a fieldworker, with the assistance of the researcher, while a second fieldworker took field notes. FGD for mothers in the microcredit group were conducted immediately following the microcredit meeting at the location where the group regularly meets. The FGD for mothers in the non-microcredit group was conducted at an easily accessible central location in the community at a time when the majority of mothers were available. FGD interview guides were translated into the local language and back translated into English, to ensure proper translation (Jagosh & Boudreau 2009). Open-ended questions were asked to encourage discussion and to explore any issues that arose (Patton 2002). All FGD were audiotape-recorded and then translated and transcribed into English by a fieldworker. Questions were developed to better understand what the main and most trusted sources of IYCF information were and why, and what influenced how and what mothers fed their children. Additionally for mothers in the microcredit group, questions examined how being in a microcredit program influenced IYCF practices and other aspects of their lives. Examining factors influencing mothers' IYCF practices may help inform future nutrition education program design for use in microcredit programs and ensure lessons are culturally appropriate.

Individual semi-structured interviews were conducted with five key informants and lasted 20 to 60 minutes (Table 3.1). They were conducted at the participants' workplaces in English by the researcher and field notes were taken. Interviews were audiotape-recorded and transcribed by the researcher. Questions addressed perceived facilitators and barriers to integrating nutrition education into a microcredit program and perceptions regarding the sustainability of nutrition education in a microcredit program over time. This information may be useful in developing recommendations for long-term sustainability of education components within a microcredit program.

Privacy and confidentiality were encouraged in FGD and maintained as much as possible. Informed and written consent for participant involvement, including audiotape recording of the FGD and interviews, was obtained. Women who were not able to sign

their name provided a thumbprint. Study participants provided consent for all photographs used in research presentations.

#### **3.4.5 Qualitative analysis**

Grounded theory guided the qualitative content analysis (Corbin & Strauss 2008). Transcripts from interviews and FGD were transcribed verbatim in word processing software and uploaded into MAXQDA 10 (VERBI GmbH 2011) to identify, code, categorize, and label the primary patterns in the data. Similar concepts were grouped together and emerging patterns, themes, and categories were determined using constant comparative analysis to generate a theory that emerged from and was connected to the data itself to explain the phenomenon of interest. Transcripts were reviewed multiple times to ensure accurate understanding of the concepts and context of the responses from participants. Field notes were also reviewed to enhance interpretation of the data.

#### **3.5 Ethical considerations**

Prior to commencing fieldwork, ethical approvals were obtained from the Research Ethics Board of the Faculty of Agriculture and Environmental Sciences at McGill University and the Institutional Review Board of Noguchi Memorial Institute of Medical Research at the University of Ghana.

**Table 3.1: Participants and duration of focus group discussions and individual interviews**

<b>Participants</b>	<b>Sample size (n)</b>	<b>Duration (min)</b>
Focus group discussion participants		30-60
Group 1: microcredit mothers of infants 6-23 mo <sup>1</sup>	6	
Group 2: microcredit mothers of infants 6-23 mo <sup>2</sup>	9	
Group 3: non-microcredit mothers of infants 6-23 mo <sup>2</sup>	6	
Interview participants <sup>3</sup>		20-60
Rural bank microcredit staff (study site)	3	
Rural bank microcredit staff (nearby district)	1	
Freedom from Hunger Ghana staff	1	

<sup>1</sup>District capital (urban); <sup>2</sup>Other study communities (rural); <sup>3</sup>One semi-structured interview was conducted with each participant

## **CHAPTER 4: MANUSCRIPT**

### **Microcredit participation among mothers improves dietary diversity of infants and young children but not growth: The case for adding nutrition education in Ghana**

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## 4.1 Abstract

**Background:** Low income is a barrier to optimal feeding practices of infants and young children (IYC). Microcredit programs for rural Ghanaian women aim to increase incomes, which may improve the quantity and quality of foods given to IYC. Programs that included nutrition education have shown improvements in child nutrition, however few studies have examined this relationship in microcredit-only programs.

**Objectives:** The primary objective was to determine the association between a mother's participation in a microcredit-only program and IYC dietary quality and nutritional status. In addition, factors influencing IYC feeding practices among mothers and the incorporation of nutrition education within a microcredit program were examined.

**Methods:** Participants included 102 active microcredit (MC) member mothers and 102 non-microcredit (NMC) member mothers and their youngest child (6-23 mo). Information was collected on IYC feeding practices, length, and weight, and household socio-demographic characteristics. Focus group discussions were conducted with one group of NMC mothers ( $n=6$ ) and two groups of MC mothers ( $n=15$  total). Individual semi-structured interviews were conducted with MC program staff ( $n=5$ ).

**Results:** A mother's participation in MC was positively associated with her child meeting minimum dietary diversity ( $\geq 4$  food groups) (aOR 1.9, 95% CI 1.04, 3.49). Compared to the NMC group, IYC in the MC group met this indicator more often (57% vs. 43%;  $p<0.05$ ) and consumed more legumes and nuts ( $p<0.05$ ), and dairy products ( $p<0.01$ ). There were no differences in nutritional status after adjusting for covariates. NMC mothers cited family as their main influence on IYC feeding practices while MC mothers cited health workers as most influential and reported that loans increased their financial independence but had little to no impact on IYC feeding practices. Barriers to incorporating nutrition education in a MC program included high staff caseload, lack of external training, and low priority status.

**Conclusion:** Private sector activities such as MC may play a role in improving the diet of IYC in Ghana; however, added nutrition education may be necessary to see improvements in child growth. Long-term partnerships between rural banks and nutrition-related organizations are needed to ensure sustainability of education components over time.

## 4.2 Introduction

Globally, an estimated 27% (171 million) of children under five years of age are stunted and 16% (104 million) are underweight with the highest rates occurring among children in Asia and Africa (Lutter et al. 2011). Poor nutrition during the first two years of life can cause substantial damage to growth and cognitive development and have lasting negative consequences for adult health and human capital (Victora et al. 2008). Optimal feeding practices are therefore crucial during the critical period of complementary feeding when other foods and liquids must be added to children's diets, in addition to breast milk, to meet their changing nutritional needs.

In Ghana, wasting and underweight affect 9% and 14% of children under five years of age, respectively, while stunting prevalence is even higher at 28% (GSS et al. 2009). Children 18-23 months of age are at greatest risk as 40% are stunted (GSS et al. 2009). The high prevalence of stunting reflects chronic dietary insufficiencies and is consistent with documented poor feeding practices of Ghanaian children (GSS et al. 2009). Anemia is the most prevalent and widespread micronutrient deficiency affecting 78% of children under five in Ghana, with the prevalence highest in children 12-17 months of age (88%); a lack of dietary iron is the primary cause (GSS et al. 2009). In addition to iron, problem nutrients also include zinc and vitamin B6 as a high percentage of these nutrients must be provided by complementary foods, yet foods commonly given to infants and young children in low-income countries often contain inadequate amounts (Dewey & Brown 2003). Other nutrients such as calcium may also be limited in complementary foods (Gibson et al. 1998).

Microcredit – the provision of small loans and financial services to groups of poor people, mainly women – has been recognized as a strategy for poverty reduction; additionally, its ability to improve the social well-being of clients' families and children has been of equal interest since it began in 1976 (Yunus 2002). Several studies have examined the effect of microcredit on child nutrition outcomes. The type of program and outcomes measured varied greatly, as did the results. In a study in Ethiopia, wasting prevalence was not different between children of microcredit participants and controls (Doocy et al. 2005). Women's access to microcredit in Malawi resulted in improved



height-for-age among female but not male children, while men's access to microcredit did not have an effect on either sex (Hazarika & Guha-Khasnobis 2008). In microcredit programs that were combined with a health and nutrition education intervention in Ghana, Bolivia, and Bangladesh, differences between participants and comparison groups who did not receive microcredit revealed timely introduction of solid foods and improvements in household food security, feeding frequency, and child weight-for-age and height-for-age (MkNelly & Dunford 1998; MkNelly & Dunford 1999; Pitt et al. 2003). These results however were not consistent between countries or programs. The studies were also not able to distinguish whether the causal effect was the microcredit or education due to the combined nature of the programs.

Since microcredit alone does not impart nutrition knowledge or communicate behavior change, the effects on nutrition as a result of a microcredit-only program are indirect. The limited evidence might suggest greater effects may be seen from integrated microcredit and education programs. Microcredit clients often live in isolated areas with limited access to health promotion efforts from different agencies and services (Daley-Harris 2009). As a result, microcredit programs that have the capacity to reach these vulnerable populations are well positioned to employ nutrition education programs that are able to address the underlying causes of poverty and poor nutrition. A better understanding of the relationship between microcredit-only programs and child nutrition outcomes is first necessary to be able to distinguish between the differential effects of microcredit and education to develop recommendations for effective program design that can be scaled up and replicated worldwide. Moreover, sustainable integration of education programs within microcredit programs remains a challenge as the scope is often beyond the financial sector alone and requires input from other organizations in both the public and private sectors (Leatherman et al. 2011). Research is thus needed examining the facilitators and barriers to incorporating nutrition education into microcredit programs and strategies for making it sustainable over time.

The present study compared dietary quality and nutritional status of children whose mothers were either active members of a microcredit-only program or non-microcredit members living in a rural district in the Eastern region of Ghana. In addition, perceptions regarding factors influencing infant and young child feeding (IYCF) practices

among mothers and the incorporation of nutrition education within a microcredit program among staff were examined using qualitative methods.

### **4.3 Methods**

#### **4.3.1 Study site**

The research was conducted in a primarily rural district in the Eastern region of Ghana. The Eastern region is the third most populous region in Ghana; it is home to over 2.5 million people, representing 11% of the total population of the country (GSS 2011). In the region, rates of wasting and underweight among children under five years of age are slightly lower than national averages (6% vs. 9% and 9% vs. 14%, respectively) (GSS et al. 2009). However, the rate of stunting is 10% higher than the national average (38% vs. 28%), reflecting chronic dietary insufficiencies (GSS et al. 2009). Anemia is prevalent and widespread throughout the region affecting almost three in four children under the age of five years (GSS et al. 2009).

##### **4.3.1.1 Microcredit program**

A rural bank located in the capital of the district runs a microcredit program. It began in July 2001 with Plan Ghana and FFH as partners. Plan Ghana provided the initial credit funds; they are an international development organization that aims to promote children rights in an effort to end poverty. FFH provided the technical support to implement their *Credit with Education* methodology (Freedom from Hunger 2012). Bank staff received training on how to run a microcredit program that combined providing credit and delivering education lessons on basic health and nutrition, and business skills for rural women. The partnership lasted three years until the bank became self-sustainable in running the program. The bank continued to follow the *Credit with Education* methodology until 2007, at which time they discontinued the education component of the program and have since only provided credit to participants.

### **4.3.3 Quantitative methods**

#### **4.3.3.1 Participants and sampling**

Mothers had to be at least 18 years of age, have a child 6 to 23 months of age, and be either an active microcredit member or not in any microcredit program currently or in the past. Mothers who met the inclusion criteria for the microcredit group were recruited during or immediately following microcredit meetings. The bank had a total of 91 microcredit groups in 44 communities throughout the district. All microcredit groups in the district capital (the urban sub-district) were sampled ( $n=16$ ). Recruitment then expanded to other communities in the district to obtain the needed sample size. Bank staff identified groups with women who had young children that were accessible from the district capital by proximity and timing of meetings. A convenience sample was taken which included 17 additional microcredit groups in 10 other communities throughout the district. In total, recruitment represented 36% of all microcredit groups and 20% of all communities with microcredit groups in the district.

Following enrollment of mother-child pairs in the microcredit group, mother-child pairs in the non-microcredit group were recruited using systematic sampling matching by community and child age. A household closest to where the microcredit meeting took place was randomly selected in each community and alternate households were sampled. Those with mothers who met the criteria were invited to participate in the study.

#### **4.3.3.2 Data collection**

All data collection tools were pretested and questionnaires were field checked by the researcher. The questionnaire was interviewer-administered and responses were recorded on paper or using a personal digital assistant.

##### **4.3.3.2.1 Socioeconomic and demographic information**

Mothers provided information on their age, number of live births, level of education reached, marital status, and primary occupation. Household information on number of people living in the household, number of rooms, housing materials, weekly food expenditure, primary source of water, access to electricity, and energy source for

cooking was also collected. Socioeconomic status (SES) was represented by a composite variable of housing materials (wall, floor, and roof), source of drinking water, and access to electricity. The score ranged from 1-5 points and was categorized into low (1-2 points) and high (3-5 points) after examining the univariate distribution. Additionally, mothers in the microcredit group provided information on the number of loan cycles completed, total amount of loans received, use of loans, and how loans changed their income and child's diet. Mothers in the non-microcredit group provided information on whether they knew about microcredit in their communities and why they did not participate in it.

#### **4.3.3.2.2 Infant and young child feeding practices**

A list-based dietary recall derived from the World Health Organization (WHO) indicators for assessing IYCF practices was used to assess the following indicators: 1) continued breastfeeding at 1 year (children 12.0-15.9 months of age), 2) introduction of solid, semi-solid, or soft foods (children 6.0-8.9 months of age), 3) minimum dietary diversity, 4) minimum meal frequency, 5) minimum acceptable diet, and 6) consumption of iron-rich or iron-fortified foods (WHO 2008a; WHO 2010a). Minimum dietary diversity was a score of  $\geq 4$  food groups after coding items in the list-based recall into the seven food groups outlined by WHO (grains, roots, and tubers; legumes and nuts; dairy products; flesh foods; eggs; vitamin-A rich fruits and vegetables; and other fruits and vegetables) and summing the total number of food groups consumed. Minimum meal frequency was determined by comparing the reported number of times a child received solid, semi-solid, or soft foods to the age-specific recommendation as per the child's breastfeeding status. Minimum number of times was: two times for breastfed infants 6.0-8.9 months, three times for breastfed children 9.0-23.9 months, and four times for non-breastfed children 6.0-23.9 months. Minimum acceptable diet was defined as meeting both minimum dietary diversity and minimum meal frequency indicators. For breastfed children, these two indicators were determined as previously described. For non-breastfed children, minimum dietary diversity was defined as a score of  $\geq 4$  food groups based on a six food group score (excluding dairy products) and minimum meal frequency was determined as previously described but also required the child to have received a minimum of two milk feeds.

#### 4.3.3.2.3 Anthropometry

Mothers reported the child's sex, birth date, and age in months. The birth date was confirmed using the child's growth monitoring card, when possible. Length and weight measurements were taken in duplicate using standardized WHO techniques (WHO 2008b) and the average values were used for analysis. The child's recumbent length was measured to the nearest 0.1 cm using a length board. The child was weighed in minimal clothing to the nearest 0.1 kg using a digital scale (Tanita, Arlington Heights, IL).

#### 4.3.3.3 Analysis

All data were analyzed using SAS software, version 9.2 (SAS Institute Inc. 2008). Z-scores of anthropometric indicators were computed using WHO Anthro software, version 3.2.2 (WHO 2011). Z-scores were initially analyzed as continuous data and then transformed into categorical data using the following classifications: underweight if weight-for-age z-score (WAZ) was less than -2, stunted if length-for-age z-score (LAZ) was less than -2, and wasted if weight-for-length z-score (WLZ) was less than -2. Differences between groups (microcredit and non-microcredit) were calculated using independent Student's t-test for normally distributed continuous variables and Chi-square (or Fisher's exact test where applicable) for categorical variables. The non-parametric Mann-Whitney Wilcoxon test was used for non-normally distributed continuous data. Multiple logistic regression analysis was used for categorical dependent variables (IYCF indicators and anthropometric classifications) and multiple linear regression analysis was used for continuous dependent variables (WAZ, LAZ, and WLZ). In both types of regression modeling, independent variables were included if they had been statistically significant or approached significance ( $p \leq 0.25$ ) in bivariate analyses or identified in the *a priori* conceptual framework and published literature. Backward elimination was done to remove non-significant variables one at a time until only variables with  $p \leq 0.1$  remained. Dummy variables for individual communities and for urban (district capital) or rural (all others) communities were created and tested in all models, but were not found to be significant. No outliers were discarded from the analyses. Results were reported at a 0.05 significance level.

#### **4.3.4 Qualitative methods**

##### **4.3.4.1 Participants and sampling**

Two microcredit groups (one from the district capital (urban) and one from the surrounding study communities (rural)) and one non-microcredit group (rural) were purposely selected to participate in focus group discussions (FGD). Mothers who were already enrolled in the study from those groups were recruited. Due to time limitations, a FGD with mothers in the non-microcredit group from the district capital (urban) was not possible.

Purposeful sampling was also used to recruit key informants for interviews. One supervisor and two field officers associated with the microcredit program at the rural bank and one staff member from FFH Ghana were invited and agreed to participate. A microcredit project coordinator from a rural bank in a nearby district who had previously been trained by FFH was identified by the FFH staff member and invited and agreed to participate.

##### **4.3.4.2 Focus group discussions**

Focus groups involved six to nine women each and lasted approximately one hour. They were conducted in the local language by a fieldworker, with the assistance of the researcher, while a second fieldworker took field notes. FGD interview guides were translated into the local language and back translated into English, to ensure proper translation (Jagosh & Boudreau, 2009). Open-ended questions were asked to encourage discussion and to explore any issues that arose (Patton, 2002). All FGD were audiotape-recorded and then translated and transcribed into English by a fieldworker. Privacy and confidentiality were encouraged and maintained as much as possible. Questions were developed to better understand what the main and most trusted sources of IYCF information were and why, and what influenced how and what mothers fed their children. Additionally for mothers in the microcredit group, questions examined how being in a microcredit program influenced IYCF practices and other aspects of their lives. Examining factors influencing mothers' IYCF practices may help inform future nutrition

education program design for use in microcredit programs and ensure lessons are culturally appropriate.

#### **4.3.4.3 Key informant interviews**

Individual semi-structured interviews were conducted with five key informants and lasted 20 to 60 minutes. They were conducted in English by the researcher and field notes were taken. Interviews were audiotape-recorded and transcribed by the researcher. Questions addressed perceived facilitators and barriers to integrating nutrition education into a microcredit program and perceptions regarding the sustainability of nutrition education in a microcredit program over time. This information may be useful in developing recommendations for long-term sustainability of education components within a microcredit program.

#### **4.3.4.4 Analysis**

Grounded theory guided the qualitative content analysis (Corbin & Strauss 2008). Transcripts from interviews and FGD were transcribed verbatim in word processing software and uploaded into MAXQDA 10 (VERBI GmbH 2011) to identify, code, categorize, and label the primary patterns in the data. Similar concepts were grouped together and emerging patterns, themes, and categories were determined using constant comparative analysis to generate a theory that emerged from and was connected to the data itself to explain the phenomenon of interest. Transcripts were reviewed multiple times to ensure accurate understanding of the concepts and context of the responses from participants. Field notes were also reviewed to enhance interpretation of the data.

#### **4.3.5 Ethical considerations**

Ethical approvals were obtained from the Research Ethics Board at McGill University in Montreal, Canada and Noguchi Memorial Institute of Medical Research Institutional Review Board at the University of Ghana in Legon, Ghana. Informed consent was obtained from all study participants; mothers consented for their own participation and additionally on behalf of their children.

## 4.4 Results

### 4.4.1 Quantitative results

#### 4.4.1.1 Study population

The study enrolled a total of 204 mother-child pairs (102 each in the microcredit and non-microcredit groups). Date of birth was confirmed with growth monitoring cards for 71% of all children. Maternal age ranged from 18 to 56, with mothers in the microcredit group being significantly older than those in the non-microcredit group (Table 4.1). They also had more children and were more likely to be married or cohabitated than mothers in the non-microcredit group. Maternal education, SES, and weekly food expenditure per person in the household did not differ between groups. Almost one third of all mothers had no formal schooling and only 39% reached secondary school. Trading was the primary occupation; however, it was more common among microcredit group mothers compared to non-microcredit group mothers.

Of those in microcredit, the average loan size was 475 GHC<sup>1</sup> (range: 20 to 2000 GHC) and mothers had received an average of six loan cycles (range: 1 to 23). The primary use of the loans was to buy more goods for trading (78%, n=80) followed by to buy inputs for farming (13%, n=13), to buy equipment for their livelihood (8%, n=8), or to pay children's school fees (1%, n=1). Eighty percent of mothers (n=82) in the non-microcredit group had heard of microcredit in their community and 81% (n=83) cited not being interested as their main reason for not participating followed by not needing the money (14%, n=14).

#### 4.4.1.2 Infant and young child feeding indicators

Half of all children met recommendations for minimum dietary diversity, with significantly more children in the microcredit versus non-microcredit group meeting this indicator (57% vs. 43%;  $p<0.05$ ). Additionally, more children in the microcredit group than those in the non-microcredit group consumed legumes and nuts ( $p<0.05$ ) and dairy products ( $p<0.01$ ) (Table 4.2). Other IYCF indicators did not differ by group. Continued

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<sup>1</sup>Expressed in Ghanaian Cedis (GHC) (1 GHC = 0.65 USD during study period)



breastfeeding was practiced in 96% of all children 12 to 15 months of age and solid, semi-solid, or soft foods were introduced in 87% of children six to eight months of age. Fifty-four percent of children met minimum meal frequency recommendations while only 32% of children achieved a minimum acceptable diet. Three out of four children consumed iron-rich or iron-fortified foods the previous day. This was mainly the consumption of iron-rich foods such as fish, beef, or chicken (73%). There was a tendency for children in the microcredit group to consume more iron-fortified foods, which included infant formula or commercial cereal (e.g., Cerelac®), versus those in the non-microcredit group (12% vs. 4%;  $p=0.07$ ), however only 8% ( $n=16$ ) of all children consumed these foods.

#### **4.4.1.3 Independent predictors of feeding indicators**

Children in the microcredit group were almost twice as likely to meet minimum dietary diversity recommendations than those whose mothers were not in microcredit ( $p<0.05$ ) (Table 4.3). Child age was also positively associated with meeting minimum dietary diversity ( $p<0.01$ ), while parity of the mother was negatively associated ( $p<0.05$ ). Similarly, child age was positively associated with consuming iron-rich or iron-fortified foods ( $p<0.01$ ), while parity of the mother tended to be negatively associated ( $p<0.07$ ). Maternal education level of secondary school or higher compared to having no formal education was positively associated with children meeting minimum meal frequency ( $p<0.001$ ) and minimum acceptable diet ( $p<0.05$ ). Marital status was a predictor only of minimum meal frequency. Children of mothers who were married or cohabitated were over five times more likely to meet this indicator than those whose mothers were single or separated ( $p<0.01$ ). Number of rooms in the household was positively associated with minimum meal frequency ( $p<0.01$ ) and consumption of iron-rich or iron-fortified foods ( $p<0.05$ ). Indicators for continued breastfeeding at one year and introduction of solid, semi-solid or soft foods were not significantly associated with any variables.

#### **4.4.1.4 Anthropometry and nutritional status**

WAZ tended to be higher among microcredit versus non-microcredit children ( $p=0.09$ ), while LAZ and WLZ did not differ between groups (Table 4.4). After adjusting

for covariates including child age, SES, and minimum dietary diversity, the association was not significant in any of the linear regression models (Table 4.5). No differences were seen between groups regarding risk of underweight, stunting, or wasting, even after adjusting for child age, minimum dietary diversity, number of rooms in household, and ownership of household (Table 4.6).

Minimum dietary diversity was the only feeding indicator significantly associated with anthropometric indicators. Meeting this indicator was positively associated with WAZ ( $p<0.01$ ), LAZ ( $p<0.05$ ), and WLZ ( $p<0.05$ ) (Table 4.5). It was also associated with a lower risk of being underweight ( $p<0.01$ ), stunted ( $p<0.01$ ), and wasted ( $p<0.05$ ) (Table 4.6). Other predictors included high SES, which was positively associated with WAZ ( $p<0.01$ ), LAZ ( $p<0.10$ ), and WLZ ( $p<0.05$ ) (Table 4.5) and child age, which was negatively associated with LAZ ( $p<0.01$ ) (Table 4.5) and increased risk of stunting ( $p<0.01$ ) (Table 4.6).

#### **4.4.2 Qualitative results**

##### **4.4.2.1 Study population**

A sample of 21 mothers who were enrolled in the quantitative study participated in FGD: six in microcredit (urban), nine in microcredit (rural), and six in non-microcredit (rural). They ranged in age from 23 to 50 years and most had between three and four children, with parity ranging from one to seven children. More than half of the mothers in microcredit had reached secondary school ( $n=8$ ), whereas in the non-microcredit group none had and only one third ( $n=2$ ) had attended primary school. Bank and FFH participants had completed at least three years of post-secondary education with levels attained ranging from higher national diploma to master's degree, and work experience in the field ranged from two to 17 years.

##### **4.4.2.2 Major themes related to child feeding practices**

This component of the study examined IYCF practices, generally and within the context of microcredit, from the perspectives of mothers. The results were organized into

themes that are discussed below and are supported with participant quotes for illustrative purposes.

#### **4.4.2.2.1 Influences on infant and young child feeding practices**

Family members were the main influence on IYCF practices cited by mothers in the non-microcredit group for both breastfeeding and complementary feeding. Community health workers or nurses were also mentioned but to a lesser extent. In both urban and rural microcredit groups, health workers were mentioned as the primary influence and most trusted source of IYCF information by the majority of mothers, with only one mother in each group citing her own mother as an influence regarding breastfeeding initiation only.

*I received my information from my mother because I gave birth in the house, so I learned how to breastfeed and feed my child with food from my mother (Mother 2 – non-microcredit rural).*

*I breastfeed my child from day one up to six months because that is what the nurses told me to do. [...] My child was exactly six months before giving him food. I can see that the breast milk was not enough for him so as I was told at the clinic, I decided to add food to the breastfeeding (Mother 1 – microcredit urban).*

Mothers had a good understanding of the recommendation to exclusively breastfeed for the first six months before beginning complementary feeding as it was consistently mentioned in all groups; only one mother from the non-microcredit group stated that she introduced foods at two months because of her perception that there was not enough breast milk. Messages about complementary feeding recommendations were less widely cited; only one mother in each microcredit group said that semi-solid foods should be introduced first. This may be due to a lack of knowledge but may also be attributed to limited probing during the focus group.

#### **4.4.2.2.2 Impact of microcredit loans on mothers and children**

Increased financial independence was the major theme resulting from the positive experiences cited by mothers in both urban and rural microcredit groups. These positive experiences included having money to contribute to the household to purchase food, the ability to pay children's school fees regularly, and opportunities to expand their businesses. However, in terms of child feeding practices, the loans had little to no impact according to mothers in both groups. In the rural group, two mothers said they were able to purchase different food items now as a result of the loan, which changed the types of foods their child eats while an equal number of mothers said there were no changes and they continued to buy and cook foods as they did before. Others did not indicate a response. Mothers in the urban microcredit group described no changes in how or what they fed their children as a result of the loans. They specifically pointed out that high interest rates were a major factor leaving no extra money to change foods in their diets.

*What I notice is the time I am not in the group, whenever my children are hungry I cook cassava with hot pepper for them to eat. Now because I am in the program, I am able to buy food items like rice in the small bag, bottle of palm oil, meat and different types of fishes of my choice. So now my children eat whatever they like, so the microcredit program is very good (Mother 3 – microcredit rural).*

*I cook my food as the normal way I used to cook (Mother 4 – microcredit rural).*

*As for me, the loan has not changed anything because the interest rate is very high [...] the loan does not change anything in terms of the child feeding because I have been buying the foodstuff as I used to buy (Mother 1 – microcredit urban).*

#### **4.4.2.3 Major themes related to nutrition education in microcredit programs**

This component of the study examined factors influencing the integration and sustainability of nutrition education in microcredit programs. If analyses of both quantitative and FGD data support nutrition education as a necessary adjunct to microcredit in order to improve IYCF practices and growth, this information may be

helpful in developing recommendations for sustainable incorporation of nutrition education within a microcredit program. The results were organized into themes that are discussed below and are supported with participant quotes for illustrative purposes.

#### **4.4.2.3.1 Benefits of *Credit with Education***

The benefits of providing nutrition education in a microcredit program were widely acknowledged by all interview participants. The primary benefit described was empowerment of women followed by improved health of children and families. Additional benefits included good repayment of loans and improved relationships between field officers and the women. All participants also expressed the effectiveness of using a microcredit group as a venue for providing education.

#### **4.4.2.3.2 Facilitators and barriers to nutrition education in a microcredit program**

The major facilitator to integrating nutrition education into a microcredit program was receiving training from external organizations, such as FFH, in order to equip bank staff with the facilitation skills needed to effectively deliver the education program along with the appropriate teaching materials. FFH also cited funding to cover these technical support costs as a facilitator.

Several barriers to sustaining nutrition education in microcredit were identified; however, the most salient points differed by whether the participant was from the bank or FFH. Bank staff identified high staff caseload, a lack of recurring training, and the cost of training as the main barriers followed by disinterest among the women and field officer apathy toward the learning sessions. On the other hand, FFH identified low priority status among banks as the main barrier followed by the cost of training and monitoring, and staff turnover resulting in a need for retraining.

*The challenge is that over time [the banks we are working with] become more commercialized. If you are going to facilitate these non-financials (education lessons), the women don't pay anything. It comes at no cost to the women. Meanwhile, [the banks] can see that same time being used to service another credit group. [...] They will not have too much interest in delivering the non-*

*financials. They don't even see the link between that one and the success of their program (FFH staff).*

Low priority was not cited directly by bank staff but was evident in their responses. Even though all bank staff participants demonstrated openness to restarting nutrition education in their programs, there seemed to be little potential of it happening in the near future.

*For now, I'm not seeing anything concrete being done about that [in the next two, five, ten years]. However, it's possible it could become all of a sudden that we are going to go back to the learning sessions. But for now, I cannot see it coming any time soon (Bank staff 1).*

#### **4.4.2.3.3 Overcoming barriers through permanent partnerships**

Suggestions of ways to overcome these barriers from bank staff included working with management to reduce caseload and creating long-term partnerships with organizations such as FFH for ongoing training and monitoring. Alternatively, FFH suggested that the bank hire an independent health educator who would be responsible for providing the education component. Cost however remained a concern.

*So for me, if I get the opportunity I would rather go into a permanent relationship with FFH. However, I believe [banks] are unable to enter into such relationships with FFH because of the costs associated with that kind of relationship because it's an institution that survives on these services and their services indeed do not come cheap (Bank staff 4).*

*If they are working in the interest of the women, they should be able to pay for that cost because yes, you are giving them credit, but that credit is not for free, they pay interest. So do something that will cost you and say this one we are just doing for you. Like pay for the services of a health educator (FFH staff).*

## 4.5 Discussion

To our knowledge this is the first study to document the association between a mother's participation in a microcredit-only program and complementary feeding practices and nutritional status of infants and young children. Although 94% of microcredit group mothers (n=96) reported that they saw an improvement in their child's diet as a result of having the loans, IYCF practices, with the exception of dietary diversity, were not different between microcredit and non-microcredit groups.

### Feeding indicators

***Microcredit participation.*** Minimum dietary diversity was the only feeding indicator significantly associated with a mother's participation in microcredit. Dietary diversity is an important aspect of IYCF as it is positively correlated with micronutrient density of the diet and nutritional status of children (Arimond & Ruel 2004; Working Group on Infant and Young Child Feeding Indicators 2006). If the relationship between participating in microcredit and children's dietary diversity is causative, increases in income might be one mechanism through which microcredit affects dietary diversity. Previous researchers have found links between microcredit and household food expenditure and consumption patterns. A combined microcredit and nutrition education program in Ghana found that participants who had significantly greater savings than non-participants ( $62.9 \text{ GHC} \pm 2.2$  vs.  $26.3 \text{ GHC} \pm 1.9$ ;  $p < 0.05$ ) tended to have higher household food expenditure ( $50.8 \pm 3.5\%$ ;  $p < 0.1$ ) and had significantly greater household consumption of animal source foods (ASF) ( $p < 0.01$ ) (Homiah et al. 2012). However, the education component of this program stressed the importance of ASF for child nutrition, which makes it difficult to determine whether the cause of the increase in ASF was due to the microcredit or education. The effects of increased income on dietary diversity have also been demonstrated in other low-income countries. As poorer households gain additional income, they often use it to purchase non-staple food items, such as fruits and vegetables (Ruel et al. 2005), and meat and milk (Delgado 2003) resulting in increased dietary diversity. These studies however did not provide information on the dietary intakes of children. Nonetheless, a study in Bangladesh showed that household monthly per capita expenditure was positively associated with the dietary diversity score of

children 6-23 months of age ( $p<0.05$ ) (Rah et al. 2010) suggesting that an improvement in dietary diversity at the household level may be sufficient to improve the diet of young children. In the present study, there were no differences between groups for weekly food expenditure per person in the household, which was the only measure of household income. Furthermore, qualitative evidence from FGD revealed that the loans did not change the foods the majority of mothers purchased or gave to their children. This suggests confirmation that microcredit mothers were using their loans primarily to improve their businesses as reported. Some microcredit mothers also reported that they were able to contribute more to the household's food expenditures as a result of the loans. Since the amount spent on food did not differ between groups, this may suggest that as women increased their monetary household contributions, others contributed less. A study in Ghana provided evidence to support this notion; in male-headed households, men reportedly reduced their contributions to household expenditures, including food, as a result of the perceived increase in women's incomes from participating in a microcredit program (Hagan et al. 2012).

Another possible explanation for the greater variety of foods consumed by microcredit group children may be due to more mothers in microcredit being traders compared to those in the non-microcredit group, as there is evidence to support that a mother's specific trade may be related to the dietary diversity of her child. Having an income generation activity related to ASF (such as selling smoked fish, eggs, or cooked food that contained ASF) was positively associated with ASF intake of children two to five years of age in Ghana (Christian et al. 2012). However, information on the specific type of trading mothers were involved in was not collected in this study. The specific food groups that were increased among microcredit group children were legumes and nuts, and dairy products, both of which were typically more expensive in comparison to other more commonly consumed foods in the study area such as grains, roots, and tubers. Since there was no difference in household food expenditure between groups, this might suggest that microcredit mothers were initially purchasing a greater variety of foods compared to non-microcredit mothers for reasons unknown.

***Maternal education and marital status.*** Only about half of all children met minimum dietary diversity and meal frequency recommendations. The low prevalence of



meeting these recommendations was reflected in an even lower prevalence of achieving a minimum acceptable diet (about one third of all children), which is a combination of dietary diversity and meal frequency indicators. Maternal education level was shown to be an important predictor of minimum meal frequency and acceptable diet indicators. In the study population, almost one third of mothers had no formal education. Previous studies found that among mothers with low education levels, improving a mother's practical knowledge on nutrition or care practices may lead to child nutritional improvements equal to or greater than those of mothers with higher levels of education (Appoh & Krekling 2005; Ruel et al. 1999). The results of these studies support the promotion of nutrition education messages as an effective strategy to improve complementary feeding practices among mothers with lower levels of education. Furthermore, being married compared to being single was positively associated with children meeting minimum meal frequency. Other studies have also found being married to be a significant predictor of good nutritional status of children (Appoh & Krekling 2005). This may be due to the added support that comes with being married allowing mothers more time and money to spend on their children, which may in turn improve diet quality and quantity. Conversely, dietary diversity was not associated with maternal education. Evidence from the literature suggests that household resources may be a greater constraint on food availability than maternal education, as dietary diversity has been shown to be positively associated with SES (Hatloy et al. 1998; Torheim et al. 2004). Although a variety of appropriate complementary foods are generally available in most settings, to achieve diversification of a child's diet, the household must have adequate income to purchase market foods. In this study, SES was not associated with dietary diversity; however, low SES was negatively associated with WAZ and WLZ while maternal education was not associated with these outcomes. These results suggest that although maternal education has an influence on certain feeding practices, SES may play a greater role in determining child nutritional status than maternal education.

***Child age, maternal parity, and number of rooms.*** Other factors influencing dietary diversity as well as the consumption of iron-rich or iron-fortified foods included child age and the number of children a mother had. As children got older they were more likely to meet these indicators. Child age has been shown to be a significant predictor of

dietary diversity (Arimond & Ruel 2004). As children age, their intake of complementary foods typically increases, leading to a greater variety of foods consumed and increased likelihood of consuming iron-rich foods. Conversely, as the number of children a mother had increased, the likelihood of meeting these indicators decreased. A study in India found that chronic child malnutrition was more common among children with three or more older siblings suggesting that as family size increased, so did competition for food in the household (Mishra & Retherford 2000). Furthermore, minimum meal frequency and consumption of iron-rich or iron-fortified foods were positively associated with number of rooms in the household. As number of rooms increased, the number of adults in the household increased ( $p < 0.0001$ ). In this district of Ghana, it was common for extended family members to live together in one household. Household composition has been shown to play a role in predicting child nutrition outcomes. There is evidence to show added support for children living in extended family households as they may provide greater ability to meet social and economic needs (Desai 1992; Gage 1997), which may translate into improved IYCF practices.

The relatively high number of children consuming iron-rich foods (75%) is encouraging as low dietary intake of iron, particularly in high poverty areas, is a major cause of iron deficiency anemia; however, anemia remains prevalent and widespread in Ghana (78% of children under five years of age are affected) (GSS et al. 2009). A study in Ethiopia examining risk factors for anemia in preschool children was not able to identify a single risk factor as the predominant predictor, rather it was influenced by a variety of environmental, maternal, and economic factors, in addition to dietary factors (Adish et al. 1999). Iron intake was the least important factor, as only 4% of children did not meet recommended nutrient intakes; however, the iron consumed was mainly from less bioavailable plant sources and their diets were high in iron absorption inhibitors. Foods used to calculate the consumption of iron-rich or iron-fortified foods indicator in the present study included flesh foods or commercially fortified foods, which are rich sources of bioavailable iron. As a result, the concern is not that children are consuming plant sources that are low in bioavailable iron rather it may be the quantity of bioavailable iron-rich foods being consumed or the presence of iron inhibitors in the diet, which were not measured in this study. Existing evidence suggests that diets in low-

income countries often lack variety and contain iron inhibitors such as phytates, which may be attributed to the high prevalence of iron-deficiency anemia despite adequate intakes of iron (Haghshenass et al. 1972).

***Indicators without predictors.*** In multiple logistic regression models there were no significant predictor variables for continued breastfeeding at one year and introduction of solid, semi-solid, or soft foods. This is likely due to the fact that initiation of breastfeeding is almost universal in Ghana and the median duration is 20 months (GSS et al. 2009) thus making continued breastfeeding at one year highly likely among all participants. Solid foods are also commonly introduced by six to eight months of age in Ghana, although the prevalence in this study population was greater than the national average (87% vs. 73%) (WHO 2010b). This difference may be due to regional variations; however, information on this indicator is currently only available at the national level.

### **Nutritional status**

Mean z-score values were below population recommendations (WHO 2011); however, prevalence of underweight and wasting were similar to regional levels for children under five years of age (9% and 5% vs. 9% and 6%, respectively) while stunting was lower in the study population (19% vs. 38%) (GSS et al. 2009). The difference in stunting may be a result of the substantial variation in living conditions and SES throughout the communities in the region or due to a large proportion of participants being from the urban district capital.

Microcredit participation was not significantly associated with child anthropometric outcomes. Similarly in Ethiopia, the evaluation of microcredit-only program on acute malnutrition in children 6-59 months measured by wasting prevalence found no differences compared to controls (Doocy et al. 2005). The researchers in this study determined wasting based on a mid upper arm circumference less than 12.5 cm or the presence of pedal edema rather than on a weight-for-height z-score less than -2. Without child height and weight measurements, other indicators of both acute and chronic malnutrition, including underweight and stunting, and continuous outcomes such as weight-for-age, height-for-age, and weight-for-height z-scores, were not able to be examined in relation to microcredit participation, which would have allowed a more

accurate comparison to the present study results. In Malawi, height-for-age of female children 0-6 years of age was positively associated with women's participation in a microcredit-only program ( $p<0.01$ ) while men's access to microcredit did not have an effect on either sex (Hazarika & Guha-Khasnobis 2008). Positive benefits of female participation in microcredit may be explained by greater access to and control over household resources of women borrowers; the additional finding that women's access to microcredit tended to be associated with increased household food expenditure ( $p<0.10$ ) in that study supports this notion. In the present study, weekly household food expenditure per person did not differ between microcredit and non-microcredit groups, which may explain why no differences were seen in nutritional status.

Meeting minimum dietary diversity was associated with improved nutritional status consistently across all anthropometric outcome variables. This provides evidence that it has a protective effect, which is consistent with previous literature. Dietary diversity was positively associated with height-for-age z-scores of children 6-23 months of age from 11 low-income countries, independent of household wealth and other socioeconomic factors (Arimond & Ruel 2004). In the present study, results of the multiple logistic regression analyses for risk of underweight, stunting, and wasting consistently showed a significant reduction in risk, yet confidence intervals were large indicating low precision in estimates. A child's risk of stunting also increased with age, which is consistent with previous findings (Victora et al. 2010).

### **Mothers' perspectives**

*Differing influences on feeding practices.* Focus groups revealed that non-microcredit mothers cited family as their primary influence on IYCF practices while microcredit mothers cited community health workers. Family information given may be conflicting to IYCF recommendations due to cultural beliefs and practices as well as common misconceptions. Poor nutrition knowledge and strict adherence to cultural beliefs and practices related to food choice/preparation and food allocation to different family members have been shown to lead to inadequate feeding practices of infants and young children (Kruger & Gericke 2003). Community health care workers play an important role in low-resource communities as they may be the only point of contact for

poorer families that are less likely to access formal health services compared to richer families, even in rural societies (Schellenberg et al. 2003). Reported compliance with advice given by health workers was not associated with SES (Schellenberg et al. 2003), providing evidence to support community health workers as an influential source of information when available and utilized in poor populations. Physical proximity to the hospital in the district, located in the capital, may have led to greater exposure of community health workers among microcredit mothers than non-microcredit mothers, which may explain differences in influences between microcredit and non-microcredit groups. However, all communities in the district were visited monthly by community health workers for child growth and monitoring but attendance was voluntary. Household composition may also determine influences on feeding practices. Grandmothers in particular play a large role in decisions about feeding practices in many cultures and have been shown to negatively impact exclusive breastfeeding rates due to early introduction of water and foods to infants in sub-Saharan Africa (Bezner Kerr et al. 2008; Otoo et al. 2009). Older women were not likely exposed to exclusive breastfeeding and therefore may have preferred to adhere to traditional beliefs and practices. The present study collected information on the number of female adults in the household but not specific information as to their relationship to the mother.

***Household impacts of microcredit.*** The majority of microcredit mothers reported that loans increased their financial independence by allowing them to contribute more money to the household, however this did not translate into changes in IYCF practices. Similarly, previous studies in Bangladesh and Ethiopia that aimed to increase supply and intake of iron-rich foods through food production interventions demonstrated improvements in income from selling the animal products they produced, but did not lead to improved dietary quality (Ahmed et al. 2000; Bouis et al. 1998). This is likely because households chose to use the increased income to support other basic needs aside from food (Ruel & Levin 2000). To see improvements in the diet, a strong nutrition education component is therefore necessary in addition to promoting animal production or, as in the present study, participating in microcredit. This theory is supported by the Health Belief Model; improving feeding practices requires a change in behavior that can only occur as a result of increases in both knowledge and skills, and not from improvements in income

alone (Becker 1974). Microcredit programs that saw changes in specific IYCF practices compared to non-participants were those that included specific nutrition messages in their programs (MkNelly & Dunford 1998; MkNelly & Dunford 1999). An educational component in combination with microcredit loans may therefore be the most effective strategy to improve IYCF practices and nutritional outcomes; however, well designed prospective studies are needed to confirm this.

### **Challenges of microcredit with education**

Effective delivery of microcredit and education services together has great large-scale potential but is not without challenges. Choosing an appropriate service delivery strategy, or combination of strategies, best suited to the bank's structure and capacity may provide a solution to the issue of high staff caseload cited by bank staff but is constrained by cost. There are three common strategies for integrating microcredit and education programs that include: linked, parallel, and unified delivery of services (Dunford 2001). Linked refers to different organizations, different service delivery staff, and same users; parallel refers to the same organization, different service delivery staff, and same users; and unified refers to the same organization, same service delivery staff, and same users. Employing an independent health educator to provide education lessons in the microcredit program, as suggested by FFH staff, would be an example of parallel service delivery. This would allow staff to specialize according to their specific service delivery (microcredit or education); however, sustainable financing of this position is a challenge (Dunford 2001). FFH's *Credit with Education* methodology is an example of a unified delivery approach. This strategy is more demanding on staff but with considerable managerial commitment to staff recruitment, training, and supervision it has the potential for banks to become financially sustainable over time due to reduced staffing costs compared to parallel service delivery (Dunford 2001). However, a lack of this commitment likely played a major role in the discontinuation of the education lessons in the present microcredit program. As a result, external training and monitoring are needed to reincorporate nutrition education into the program, which again are constrained by cost.

The pressure for microcredit institutions to become financially sustainable may explain the low priority placed on education among bank staff in the present microcredit program. The costs associated with adding non-financial services are often high making some argue that microcredit institutions should focus only on what they know best which is providing financial services alone (Pronyk et al. 2007). However, ignoring the health of clients may actually negate poverty reduction and increase loan defaults as repayment rates have been shown to decline with poor client health (Noble 2001) thus providing evidence to support investing in education programs regardless of the cost.

#### **4.5.1 Study limitations**

A few limitations to this study should be considered when interpreting the results. Since a convenience sampling method was used the results may not be representative of mothers and children in the district. Recall bias also exists due to the nature of the questions asked to determine IYCF indicators and other independent variables. Moreover, the IYCF indicators do not provide quantitative details regarding quality of foods (e.g., energy density) therefore information on specific nutrient intake is unavailable. No direct measure of income or household wealth was collected therefore household food expenditure and SES were used as proxies. As a result, it is possible that the lack of variation between groups for these variables is due to the use of indirect measures rather than a true similarity between groups. It is also important to consider selection bias when examining the effects of microcredit programs on participants compared to non-participants as women self-select to be in microcredit and may therefore be inherently different than those who do not participate. Furthermore, the cross-sectional design of the study allowed only associations to be inferred rather than causality. Regarding FGD, responses in all groups were limited as some mothers chose not to respond to the questions therefore results might not be reflective of all participants. This is likely attributed to the limited probing during the FGD but may also have been influenced by the presence of the foreign researcher. Furthermore, due to time limitations, a FGD with mothers in the non-microcredit group from the district capital (urban) was not possible. It may have provided additional information with which to make more accurate comparisons between microcredit and non-microcredit, and urban and rural mothers.

#### **4.6 Conclusions**

This study revealed that a mother's participation in a microcredit-only program in rural Ghana was associated with improvements in dietary diversity of infants and young children, but not other feeding indicators or growth. There is recent evidence to support dietary diversity and maternal education to be among the most promising interventions to improve the nutrition of young children (Marriott et al. 2011). Private sector activities such as microcredit may therefore play a role in improving the diet of infants and young children in Ghana; however, added nutrition education may be necessary to see improvements in other feeding indicators and growth. Given the low level of education among mothers in this study population, they would likely benefit from this type of integrated program. Microcredit programs are often assumed to improve health among participants and their families as a result of positive benefits on financial outcomes; however, future longitudinal or prospective randomized controlled studies are needed to confirm these findings and better assess causality. Finally, barriers to incorporating nutrition education into a microcredit program are evident. Convincing management of the benefits of adding nutrition education is an essential first step in establishing it as a priority within a microcredit program. Long-term partnerships among rural banks and nutrition-related organizations are then needed to provide the public health expertise and program delivery strategies, and to ensure sustainability of education components over time.



**Table 4.1: Household demographic and socioeconomic characteristics of 204 Ghanaian mothers with infants and young children by microcredit or non-microcredit group<sup>1</sup>**

Characteristic	All n=204		Microcredit n=102		Non-microcredit n=102		P-value <sup>2</sup>
Maternal age (y)	30.5	± 7.9	33.0	± 8.1	28.1	± 7.0	<0.0001
Parity (#)	3.4	± 1.9	3.8	± 1.9	3.0	± 1.7	0.0015
Marital status							0.0381
Married or cohabitated	89.7	(183)	94.1	(96)	85.3	(87)	
Single or separated	10.3	(21)	5.9	(6)	14.7	(15)	
Maternal formal education <sup>3</sup>							0.9861
None	31.9	(65)	32.4	(33)	31.4	(32)	
Primary	29.4	(60)	29.4	(30)	29.4	(30)	
Secondary & higher	38.7	(79)	38.2	(39)	39.2	(40)	
Primary occupation							0.0036
Trader	63.7	(130)	73.5	(75)	53.9	(55)	
Farmer	22.5	(46)	17.6	(18)	27.5	(28)	
Other <sup>4</sup>	10.3	(21)	8.8	(9)	11.8	(12)	
Unemployed	3.4	(7)	0.0	(0)	6.9	(7)	
Socioeconomic status <sup>5</sup>							0.4838
Low	49.5	(101)	47.1	(48)	52.0	(53)	
High	50.5	(103)	52.9	(54)	48.0	(49)	
Type of dwelling							0.8862
Whole house	60.3	(123)	59.8	(61)	60.8	(62)	
Room(s) in house	39.7	(81)	40.2	(41)	39.2	(40)	
Owens dwelling	48.5	(99)	51.0	(52)	46.1	(47)	0.5571
Rooms in household (#)	3.9	± 2.2	4.3	± 2.2	3.5	± 2.2	0.0019
Members in household (#)	7.2	± 3.1	7.8	± 2.9	6.6	± 3.1	0.0007
Weekly food expenditure per person in household (GHC) <sup>6</sup>	4.55	± 2.95	4.81	± 3.10	4.29	± 2.79	0.1758

<sup>1</sup>Data are presented as mean ± SD or % (n); <sup>2</sup>Mann-Whitney Wilcoxon non-parametric test, Chi square, and Fisher's exact test when appropriate were used to detect group differences; <sup>3</sup>Level of school started but not necessarily finished; <sup>4</sup>Teacher, palm wine tapper, student, hairdresser, seamstress, nurse, banking; <sup>5</sup>Based on a composite score reflecting housing materials (wall, roof, floor), source of drinking water, and access to electricity (low [1-2 points] or high [3-5 points]); <sup>6</sup>Expressed in Ghanaian Cedis (GHC) (1 GHC = 0.65 USD) during study period

**Table 4.2: Food groups consumed the previous day among 204 Ghanaian infants and young children by microcredit or non-microcredit group<sup>1</sup>**

<b>Food group</b>	<b>All n=204</b>	<b>Microcredit n=102</b>	<b>Non-microcredit n=102</b>	<b>P-value<sup>2</sup></b>
Grains, roots, & tubers	92.2 (188)	91.2 (93)	93.1 (95)	0.4473
Legumes & nuts	21.6 (44)	27.5 (28)	15.7 (16)	0.0411
Dairy products	24.0 (49)	32.4 (33)	15.7 (16)	0.0053
Flesh foods	73.0 (149)	72.5 (74)	73.5 (75)	0.8746
Eggs	29.4 (60)	34.3 (35)	24.5 (25)	0.1244
Vitamin-A rich fruits & vegetables	64.7 (132)	61.8 (63)	67.6 (69)	0.4652
Other fruits & vegetables	31.4 (64)	31.4 (32)	31.4 (32)	1.0000

<sup>1</sup>Data are presented as % (n); <sup>2</sup>Chi square was used to detect group differences

**Table 4.3: Variables associated with WHO infant and young child feeding indicators in 204 Ghanaian infants and young children: Unadjusted and adjusted odds ratios**

WHO IYCF indicator	Variable	Unadjusted			Adjusted <sup>1</sup>		
		OR	95% CI	P-value	OR	(95% CI)	P-value
Minimum dietary diversity (yes) <sup>2</sup>	Microcredit (yes)	1.74	(1.00, 3.02)	0.051	1.90	(1.04, 3.49)	0.037
	Child age (mo)	1.09	(1.03, 1.15)	0.002	1.09	(1.03, 1.15)	0.003
	Parity (#)	0.86	(0.74, 1.00)	0.054	0.81	(0.69, 0.96)	0.012
	Rooms in household (#)	1.12	(0.99, 1.27)	0.084	1.12	(0.97, 1.28)	0.113
Minimum meal frequency (yes) <sup>3</sup>	Microcredit (yes)	1.27	(0.73, 2.20)	0.400	0.96	(0.52, 1.77)	0.888
	Child age (mo)	1.02	(0.97, 1.08)	0.445	1.02	(0.97, 1.08)	0.425
	Maternal formal education <sup>4</sup>						
	None	1.00			1.00		
	Primary	1.23	(0.61, 2.50)	0.564	1.20	(0.58, 2.50)	0.628
	Secondary & higher	3.23	(1.62, 6.42)	<0.001	3.68	(1.75, 7.75)	<0.001
	Marital status						
	Single or separated	1.00			1.00		
Minimum acceptable diet (yes) <sup>5</sup>	Married or cohabitated	3.29	(1.22, 8.87)	0.019	5.55	(1.83, 16.89)	0.003
	Rooms in household (#)	1.22	(1.07, 1.40)	0.004	1.23	(1.06, 1.44)	0.008
	Microcredit (yes)	1.57	(0.87, 2.84)	0.136	1.44	(0.77, 2.70)	0.250
	Child age (mo)	1.03	(0.97, 1.09)	0.297	1.03	(0.97, 1.09)	0.338
	Maternal education						
	None	1.00			1.00		
	Primary	0.93	(0.41, 2.12)	0.867	0.90	(0.39, 2.06)	0.795
	Secondary & higher	2.56	(1.25, 5.25)	0.010	2.38	(1.14, 4.96)	0.021
	Rooms in household (#)	1.18	(1.03, 1.34)	0.016	1.14	(0.99, 1.31)	0.072
	Microcredit (yes)	0.95	(0.50, 1.79)	0.872	0.88	(0.43, 1.78)	0.720
Consumption of iron-rich or iron-fortified foods (yes) <sup>6</sup>	Child age (mo)	1.10	(1.04, 1.18)	0.003	1.11	(1.04, 1.18)	0.003
	Parity (#)	0.87	(0.73, 1.02)	0.087	0.85	(0.71, 1.01)	0.069
	Rooms in household (#)	1.19	(1.01, 1.40)	0.035	1.23	(1.03, 1.47)	0.020
	Microcredit (yes)	0.95	(0.50, 1.79)	0.872	0.88	(0.43, 1.78)	0.720

WHO, World Health Organization; IYCF, Infant and young child feeding; OR, odds ratio; CI, confidence interval; <sup>1</sup>All independent variables adjusted for in each logistic regression model are shown; <sup>2</sup>Received foods from ≥ 4 food groups the previous day (Food groups are: grains, roots, and tubers; legumes and nuts; dairy products; flesh foods; eggs; vitamin-A rich fruits and vegetables; and other fruits and vegetables); <sup>3</sup>Received solid, semi-solid, or soft foods at least 2 times for breastfed infants 6.0-8.9 mo, 3 times for breastfed children 9.0-23.9 mo, and 4 times for non-breastfed children 6.0-23.9 mo the previous day; <sup>4</sup>Level of school started but not necessarily finished; <sup>5</sup>Met recommendations for both minimum dietary diversity and meal frequency the previous day; <sup>6</sup>Received an iron-rich or iron-fortified food specially designed for infants and young children, or is fortified in the home the previous day

**Table 4.4: Anthropometric indicators of 204 Ghanaian infants and young children by microcredit or non-microcredit group<sup>1</sup>**

Characteristic	All n=204	Microcredit n=102	Non-microcredit n=102	P-value <sup>2</sup>
Weight-for-age z-score	-0.56 ± 1.08	-0.43 ± 1.13	-0.69 ± 1.03	0.0941
Length-for-age z-score	-0.98 ± 1.42	-0.83 ± 1.37	-1.12 ± 1.45	0.1109
Weight-for-length z-score	-0.07 ± 1.07	-0.01 ± 1.04	-0.13 ± 1.10	0.3976
Underweight <sup>3</sup>	8.8 (18)	6.9 (7)	10.8 (11)	0.3235
Stunted <sup>4</sup>	18.6 (38)	15.7 (16)	21.6 (22)	0.2806
Wasted <sup>5</sup>	4.9 (10)	4.9 (5)	4.9 (5)	1.0000

<sup>1</sup>Data are presented as mean ± SD or % (n); <sup>2</sup>Student's t test, Mann-Whitney Wilcoxon non-parametric test, and Chi square were used to detect group differences; <sup>3</sup>Weight-for-age z-score < -2; <sup>4</sup>Length-for-age z-score < -2; <sup>5</sup>Weight-for-length z-score < -2

**Table 4.5: Multiple linear regression: Variables associated with weight-for-age, length-for-age, and weight-for-length z-scores in 204 Ghanaian infants and young children**

Variable	Weight-for-age z-score <sup>1</sup>			Length-for-age z-score <sup>2</sup>			Weight-for-length z-score <sup>3</sup>		
	β	SE	P-value	β	SE	P-value	β	SE	P-value
Microcredit (yes)	0.175	0.147	0.236	0.248	0.193	0.201	0.059	0.149	0.693
Child age (mo)	-0.015	0.014	0.280	-0.061	0.019	0.001	0.010	0.014	0.493
Socioeconomic status (high) <sup>4</sup>	0.383	0.146	0.010	0.346	0.192	0.072	0.289	0.148	0.052
Minimum dietary diversity (yes) <sup>5</sup>	0.485	0.151	0.002	0.422	0.197	0.034	0.365	0.152	0.017

All independent variables adjusted for in each linear regression model are shown; <sup>1</sup>Model: Adjusted-R<sup>2</sup> = 0.0782, *p* = 0.0004; <sup>2</sup>Model: Adjusted-R<sup>2</sup> = 0.0715, *p* = 0.0009; <sup>3</sup>Model: Adjusted-R<sup>2</sup> = 0.0376, *p* = 0.0202; <sup>4</sup>Based on a composite score reflecting housing materials (wall, roof, floor), source of drinking water, and access to electricity (low [1-2 points] or high [3-5 points]); <sup>5</sup>Received foods from ≥ 4 food groups the previous day (Food groups are: grains, roots, and tubers; legumes and nuts; dairy products; flesh foods; eggs; vitamin-A rich fruits and vegetables; and other fruits and vegetables)

**Table 4.6: Multiple logistic regression: Variables associated with risk of underweight, stunting, and wasting in 204 Ghanaian infants and young children**

Variable	Underweight <sup>1</sup>			Stunting <sup>2</sup>			Wasting <sup>3</sup>		
	aOR	95% CI	P-value	aOR	95% CI	P-value	aOR	95% CI	P-value
Microcredit (yes)	0.61	(0.21, 1.78)	0.363	0.69	(0.31, 1.52)	0.351	1.15	(0.30, 4.43)	0.842
Child age (mo)	1.02	(0.93, 1.12)	0.689	1.14	(1.06, 1.23)	<0.001	0.90	(0.79, 1.04)	0.154
Minimum dietary diversity (yes) <sup>4</sup>	0.14	(0.04, 0.54)	0.004	0.29	(0.13, 0.67)	0.004	0.10	(0.01, 0.87)	0.037
Rooms in household (#)	1.37	(1.10, 1.71)	0.006	1.11	(0.93, 1.32)	0.247	1.25	(0.94, 1.67)	0.133
Owner of dwelling									
Non-family member(s)	1.00			1.00			1.00		
Extended family member(s)	0.88	(0.18, 4.27)	0.870	1.43	(0.36, 5.72)	0.613	1.11	(0.17, 7.31)	0.917
Self/Household	0.58	(0.13, 2.71)	0.697	3.52	(1.03, 12.06)	0.045	0.04	(0.04, 2.79)	0.330

aOR, adjusted odds ratio; CI, confidence interval; All independent variables adjusted for in each logistic regression model are shown; <sup>1</sup>Weight-for-age z-score < -2; <sup>2</sup>Length-for-age z-score < -2; <sup>3</sup>Weight-for-length z-score < -2; <sup>4</sup>Received foods from ≥ 4 food groups the previous day (Food groups are: grains, roots, and tubers; legumes and nuts; dairy products; flesh foods; eggs; vitamin-A rich fruits and vegetables; and other fruits and vegetables)

## **CHAPTER 5: FINAL CONCLUSIONS**

Risk of malnutrition and growth failure is high among infants and young children in Ghana and other low-income countries. It is largely attributed to inadequate dietary intake and poor health status, which are constrained by poverty and poor caregiver knowledge among other factors. Few researchers have examined the effects of microcredit programs on child nutrition outcomes even though it is often assumed that because of its positive benefits on financial outcomes, it also leads to improved health among participants and their families. Those who have examined this relationship mainly looked at microcredit programs that included health and nutrition education. To our knowledge this is the first study to document the association between a mother's participation in a microcredit-only program and feeding practices and nutritional status of infants and young children. Improvements in dietary diversity of infants and young children were associated with microcredit participation among mothers, while other feeding indicators and growth were not. Culturally appropriate nutrition education focusing on improving dietary diversity and increasing meal frequency is needed to see greater impacts on other feeding indicators and to improve child growth. Sustainable incorporation of nutrition education in microcredit programs needs to become a priority. It is not without challenges though, therefore effective program design and strong collaborations with nutrition-related partners are necessary to help overcome some of these concerns. Microcredit programs are an underutilized opportunity with great potential for simultaneously tackling poverty and improving child nutrition in Ghana that should not be overlooked.

## **5.1 Recommendations for future research**

Future research should:

1. Confirm these findings with longitudinal or prospective randomized controlled studies in Ghana and other low-income countries that include a microcredit-only group, microcredit plus education, and control group in order to better assess causality.
2. Examine changes in income and household food expenditures and how they relate to feeding practices among microcredit participants and infants and young children.
3. Examine the quality, intensity, and frequency of exposure to education components in microcredit programs and actual ability to improve maternal knowledge and child feeding practices.
4. Develop recommendations for increasing priority of nutrition education in microcredit programs to ensure sustainable and cost-effective program design and implementation.

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## **APPENDICES**

### **Appendix 1: Informed consent forms**

#### **Main Study - Informed Consent Form**

##### **Title of Study: A mother's participation in a microcredit program and young child well-being in Ghana**

Researcher: Valerie Friesen, McGill University

Supervisors: Grace Marquis, Ph.D., School of Dietetics and Human Nutrition, McGill University; Esi Colecraft, Ph.D., Dept. of Nutrition and Food Science, University of Ghana

##### **Introduction**

You are invited to take part in a research study. Please take your time to decide whether you would like to participate. You may ask questions at any time. The purpose of this study is to examine the association of a mother's participation in a microcredit program and young child well-being; and to examine the factors influencing nutrition education in microcredit programs.

##### **Description of Procedures**

If you agree to participate, your involvement in this study will include an interview, lasting up to 1 hour. When you are interviewed, you may skip any question that you do not wish to answer or that makes you feel uncomfortable. A fieldworker will collect information about your child's feeding practices and characteristics about your household (e.g. number of people in the household). The staff will also take body measurements including weight and length of your child. This will take about 15 minutes. Photographs may be taken during the interview to be used in future presentations to help describe how the study was carried out and the community where the study took place.

##### **Risks**

There are no risks to you or your child for participating in this study.

##### **Benefits**

You will be provided with accurate information concerning the weight and length of your child. There is no other direct benefit to you for participating in this study; however, the information gained may benefit communities by providing insights into the importance of providing nutrition education in programs such as microcredit.

##### **Compensation**

Participants will not be compensated. However, a small thank you gift (such as a bar of soap) will be given to participants for their help with the project.

##### **Participant Rights**

Your participation is completely voluntary. You may choose not to participate or to leave the study at any time.

### Confidentiality

All records that may be used to identify you or that contain information about you will be kept confidential. You will be assigned a unique code number, and this code will be used on forms instead of your name. Only the study's researchers will have access to the documents linking your name to your code. Documents will be kept in a locked cabinet, and electronic computer files will be password protected. Upon completion of this study, the files linking your name to your code number will be destroyed. Any published results will keep your identity confidential and your name will not be linked to interview quotes. Photographs of you or your child will only be used with your consent and your name will not be linked to any photographs.

### Questions or Problems?

You are encouraged to ask questions at any time during this study. For more information about this research project, please contact:

Valerie Friesen valerie.friesen@mail.mcgill.ca School of Dietetics and Human Nutrition 21,111 Lakeshore Road Ste Anne de Bellevue, QC H9X 3V9 Canada Telephone: 514-398-7839	Dr. Grace Marquis grace.marquis@mcgill.ca  CINE Building 21,111 Lakeshore Road Ste Anne de Bellevue, QC H9X 3V9 Canada Telephone: 514-398-7839	Dr. Esi Colecraft Department of Nutrition and Food Science University of Ghana Legon, Ghana Telephone: +233-244-107633
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If you have questions about your rights as a research participant, or if you would like to verify ethical approval of this study, please feel free to contact: the Institutional Review Board Chairman at Noguchi Memorial Institute for Medical Research, Ghana, (Tel: 020-8152360), or McGill Ethics Officer at lynda.mcneil@mcgill.ca, 845 Sherbrooke Street West, Room 429, Montreal, QC H3A 2T5 (Tel: 1-514-398-6831).

### Participant Signature

Your signature indicates that you agree voluntarily to participate in this study, that the study has been explained to you, that you have had enough time to read the consent form and that your questions have been answered to your satisfaction.

I agree to have photographs taken of me or my child. \_\_\_\_\_ YES \_\_\_\_\_ NO

I agree that the photographs may be used as described above. \_\_\_\_\_ YES \_\_\_\_\_ NO

\_\_\_\_\_  
Child's Name (Printed)

\_\_\_\_\_  
Participant's Name (Printed)

\_\_\_\_/\_\_\_\_/\_\_\_\_  
Date (DD/MMM/YY)

\_\_\_\_\_  
Participant's Signature/Thumb-Print

**Researcher Statement**

I certify that the participant has been given adequate time to read and learn about the study and that all of their questions have been answered. The participant understands the purpose, procedures, potential risks and benefits associated with this study, and has voluntarily agreed to participate.

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Signature of person obtaining informed consent

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/ /  
Date (DD/MMM/YY)

## **Focus Group Interview - Informed Consent Form**

### **Title of Study: A mother's participation in a microcredit program and young child well-being in Ghana**

Researcher: Valerie Friesen, McGill University

Supervisors: Grace Marquis, Ph.D., School of Dietetics and Human Nutrition, McGill University; Esi Colecraft, Ph.D., Dept. of Nutrition and Food Science, University of Ghana

### **Introduction**

You are invited to take part in a research study. Please take your time to decide whether you would like to participate. You may ask questions at any time. The purpose of this study is to examine the association of a mother's participation in a microcredit program and young child well-being; and to examine the factors influencing nutrition education in microcredit programs.

### **Description of Procedures**

If you agree to participate in this study, your involvement will include taking part in one group interview, lasting a maximum of 2 hours. This interview will be tape-recorded. During the interview, you will be asked about your perceptions of the microcredit program, how it has impacted you and/or the health of your children and what nutrition education you have received. You may choose to not answer any question that you do not wish to answer or that would make you feel uncomfortable. Photographs may be taken during the interview to be used in future presentations to help describe how the study was carried out and the community where the study took place.

### **Risks**

There may be a chance that you could disclose personal or sensitive information to other group members during focus group discussions. As a result, the risks could be emotional, social and/or psychological.

### **Benefits**

There is no direct benefit to you for participating in this study; however, the information gained may benefit communities by providing insights into the importance of providing nutrition education in programs such as microcredit to overcome some of the barriers to appropriate child-feeding practices.

### **Compensation**

Participants will not be compensated. However, a small thank you gift (such as a bar of soap) will be given to participants for their help with the project.

### **Participant Rights**

Your participation is completely voluntary. You may choose not to participate or to leave the study at any time.

### **Confidentiality**

All information collected will not be linked to you personally. No identifier will be recorded. Only the study's researchers will have access to the information.

Documents and audiotapes will be kept in a locked cabinet and electronic computer files will be password protected. Upon completion of the analysis of this study, the audiotapes will be destroyed. Upon completion of this study, the files linking your name to your code number will be destroyed. Any published results will keep your identity confidential and your name will not be linked to interview quotes or data. Photographs of you or your child will only be used with your consent and your name will not be linked to any photographs. Confidentiality will be encouraged in the group but cannot be assured by all participants.

### Questions or Problems?

You are encouraged to ask questions at any time during this study. For more information about this research project, please contact:

Valerie Friesen valerie.friesen@mail.mcgill.ca School of Dietetics and Human Nutrition 21,111 Lakeshore Road Ste Anne de Bellevue, QC H9X 3V9 Canada Telephone: 514-398-7839	Dr. Grace Marquis grace.marquis@mcgill.ca  CINE Building 21,111 Lakeshore Road Ste Anne de Bellevue, QC H9X 3V9 Canada Telephone: 514-398-7839	Dr. Esi Colecraft Department of Nutrition and Food Science University of Ghana Legon, Ghana Telephone: +233-244-107633
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If you have questions about your rights as a research participant, or if you would like to verify ethical approval of this study, please feel free to contact: the Institutional Review Board Chairman at Noguchi Memorial Institute for Medical Research, Ghana, (Tel: 020-8152360), or McGill Ethics Officer at lynda.mcneil@mcgill.ca, 845 Sherbrooke Street West, Room 429, Montreal, QC H3A 2T5 (Tel: 1-514-398-6831).

### Participant Signature

Your signature indicates that you agree voluntarily to participate in this study, that the study has been explained to you, that you have had enough time to read the consent form and that your questions have been answered to your satisfaction.

I agree to be tape-recorded. \_\_\_\_YES \_\_\_\_NO

I agree to have photographs taken of me or my child. \_\_\_\_YES \_\_\_\_NO

I agree that the photographs may be used as described above. \_\_\_\_YES \_\_\_\_NO

\_\_\_\_\_  
Participant's Name (Printed)                      \_\_\_\_/\_\_\_\_/\_\_\_\_  
Date (DD/MMM/YY)

\_\_\_\_\_  
Participant's Signature/Thumb-Print

### Researcher Statement

I certify that the participant has been given adequate time to read and learn about the study and that all of their questions have been answered. The participant understands the purpose, procedures, potential risks and benefits associated with this study, and has voluntarily agreed to participate.

\_\_\_\_\_  
Signature of person obtaining informed consent                      \_\_\_\_/\_\_\_\_/\_\_\_\_  
Date (DD/MMM/YY)

## **Individual Interview - Informed Consent Form**

### **Title of Study: A mother's participation in a microcredit program and young child well-being in Ghana**

Researcher: Valerie Friesen, McGill University

Supervisors: Grace Marquis, Ph.D., School of Dietetics and Human Nutrition, McGill University; Esi Colecraft, Ph.D., Dept. of Nutrition and Food Science, University of Ghana

### **Introduction**

You are invited to take part in a research study. Please take your time to decide whether you would like to participate. You may ask questions at any time. The purpose of this study is to examine the association of a mother's participation in a microcredit program and young child well-being; and to examine the factors influencing nutrition education in microcredit programs.

### **Description of Procedures**

If you agree to participate, your involvement in this study will include a tape-recorded interview, lasting up to 1½ hours. You may refuse tape-recording or ask to stop the tape at any time. During the interview, you will be asked about your involvement and experiences in integrating nutrition education into microcredit programs and your perceptions regarding its sustainability. You may choose to not answer any question that you do not wish to answer or that would make you feel uncomfortable.

Photographs may be taken during the interview to be used in future presentations to help describe how the study was carried out and the community where the study took place.

### **Risks**

There are no risks to you for participating in this study.

### **Benefits**

There is no direct benefit to you for participating in this study; however, the information gained may benefit communities by providing insights into the importance of providing nutrition education in programs such as microcredit to overcome some of the barriers to appropriate child-feeding practices.

### **Compensation**

Participants will not be compensated.

### **Participant Rights**

Your participation is completely voluntary. You may choose not to participate or to leave the study at any time.

### **Confidentiality**

All records that may be used to identify you or that contain information about you will be kept confidential. You will be assigned a unique code number and this code will be used on forms and interview transcripts instead of your name. Only the study's researchers will have access to the documents linking your name to your code.

Documents and audiotapes will be kept in a locked cabinet and electronic computer

files will be password protected. Upon completion of this study, the files linking your name to your code number will be destroyed. Any published results will keep your identity confidential and your name will not be linked to interview quotes. Photographs of you will only be used with your consent and your name will not be linked to any photographs.

### Questions or Problems?

You are encouraged to ask questions at any time during this study. For more information about this research project, please contact:

Valerie Friesen valerie.friesen@mail.mcgill.ca School of Dietetics and Human Nutrition 21,111 Lakeshore Road Ste Anne de Bellevue, QC H9X 3V9 Canada Telephone: 514-398-7839	Dr. Grace Marquis grace.marquis@mcgill.ca  CINE Building 21,111 Lakeshore Road Ste Anne de Bellevue, QC H9X 3V9 Canada Telephone: 514-398-7839	Dr. Esi Colecraft Department of Nutrition and Food Science University of Ghana Legon, Ghana Telephone: +233-244-107633
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If you have questions about your rights as a research participant, or if you would like to verify ethical approval of this study, please feel free to contact: the Institutional Review Board Chairman at Noguchi Memorial Institute for Medical Research, Ghana, (Tel: 020-8152360), or McGill Ethics Officer at lynda.mcneil@mcgill.ca, 845 Sherbrooke Street West, Room 429, Montreal, QC H3A 2T5 (Tel: 1-514-398-6831).

### Participant Signature

Your signature indicates that you agree voluntarily to participate in this study, that the study has been explained to you, that you have had enough time to read the consent form and that your questions have been answered to your satisfaction.

I agree to be tape-recorded. ☐ YES ☐ NO

I agree to be photographed. ☐ YES ☐ NO

I agree that the photographs may be used as described above. ☐ YES ☐ NO

\_\_\_\_\_  
Participant's Name (Printed) \_\_\_\_\_  
Date

\_\_\_\_\_  
Participant's Signature/Thumb-Print

### Researcher Statement

I certify that the participant has been given adequate time to read and learn about the study and that all of their questions have been answered. The participant understands the purpose, procedures, potential risks and benefits associated with this study, and has voluntarily agreed to participate.

\_\_\_\_\_  
Researcher's Signature \_\_\_\_\_  
Date

## Appendix 2: Data collection forms

### Title of Study: A mother's participation in a microcredit program and young child nutrition in Ghana

Individual identifier:  Interviewer code:

Date completed (DD/MMM/YY): \_\_ \_\_ / \_\_ \_\_ \_\_ / \_\_ \_\_

Informed consent obtained: ☐ 0=No, 1=Yes

#### A. Socio-demographic characteristics

A1. Mother's age (years): \_\_ \_\_

A2. Number of children: \_\_ \_\_

A3. How many people live in your household? \_\_ \_\_

Children 0-5 years: \_\_ \_\_ Children 6-12 years: \_\_ \_\_ Children 13-17 years: \_\_ \_\_

Male adults: \_\_ \_\_ Female adults: \_\_ \_\_

A4. Is the father of this child in the household? \_\_\_\_ 0=No, 1=Yes

A5. How many years of education have you completed? \_\_ \_\_

Check all completed categories:

None= \_\_  
Class 1-6 (Primary) = \_\_  
Junior Secondary School:  
JSS 1= \_\_  
JSS2= \_\_  
JSS3/Middle School= \_\_

Senior Secondary School:  
SSS 1= \_\_  
SSS 2= \_\_  
SSS 3= \_\_  
Voc/Tech= \_\_  
Prof. Diploma= \_\_  
University= \_\_  
Other/Informal= \_\_ Number of years: \_\_

A6. What is your marital status? \_\_\_\_

1=Married  
2=Cohabitation  
3=Single

4=Divorced  
5=Separated  
6=Widowed

A7. What is your main occupation? \_\_\_\_

1=Farmer  
2=Trader

3=Other, Specify: \_\_\_\_\_

If A7=1 (Farmer) → Go to A7b

A7b. Do you trade or sell your farm products in the market? \_\_\_\_ 0=No, 1=Yes

A8. Are you self-employed or salaried? \_\_\_\_

1=Self-employed, 2=Salaried, 3=None



A9. How much money does your household spend on average on food each week (Ghana cedis)? \_\_\_\_ . \_\_\_\_

A10. Who makes decisions on how money is spent on food in your household? \_\_\_\_

1=Husband or partner

5=Mother-in-law

2=Father

6=Self

3=Mother

7=Other, Specify: \_\_\_\_\_

4=Father-in-law

A11. Who contributes to this money? Check all who contribute:

Husband or partner = \_\_\_\_

Mother-in-law = \_\_\_\_

Father = \_\_\_\_

Self = \_\_\_\_

Mother = \_\_\_\_

Other = \_\_\_\_ Specify: \_\_\_\_\_

Father-in-law = \_\_\_\_

A12. Is the participant in microcredit? \_\_\_\_ 0=No, 1=Yes

If A12=1 (Yes) → Go to Section B: Microcredit participants

If A12=0 (No) → Go to Section C: Comparison group participants

## **B. Microcredit participants:**

Group identifier:

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B1. How many cycles of loans have you received? \_\_\_\_

B2. How much money have you borrowed in total from the bank (Ghana cedis)?

\_\_\_\_ . \_\_\_\_

B3. What do you use the loans for? \_\_\_\_

1=To buy more goods for trading

2=To buy equipment for livelihood, e.g. net

3=To buy inputs for farming such as fertilizer or seed

4=Personal use

5=Other, Specify: \_\_\_\_\_

B4. How have the loans changed your overall income? \_\_\_\_

1=Same, 2=Increased, 3=Decreased

B5. Do you notice a difference in your child's diet because of having the loans? \_\_\_\_

1=Same, 2=Improved, 3=Worsened

## **C. Comparison group participants:**

Community identifier:

--	--

C1. Do you know any women who are in a microcredit program? \_\_\_\_ 0=No, 1=Yes

C2. Have you heard of the microcredit program in your community? \_\_\_\_ 0=No, 1=Yes

C3. Why don't you participate in a microcredit program? \_\_\_\_

1=Never heard of it

3=Don't need the money

2=Not interested

4=Other, Specify: \_\_\_\_\_

## **D. Household characteristics**

D1. What type of dwelling do you live in? \_\_\_\_\_  
1=Whole house, 2=Room(s) in a house, 3=Kiosk, 4=Other, Specify: \_\_\_\_\_

D2. Who owns this dwelling? \_\_\_\_\_  
1=You/your household, 2= Extended family member(s), 3=Non-family member

D3. What is the main material for the walls? \_\_\_\_\_  
1=Cement, 2=Mud, 3=Other, Specify: \_\_\_\_\_

D4. What is the main material for the roof? \_\_\_\_\_  
1=Aluminum, 2=Thatching, 3=Corrugated iron/zinc, 4=Other, Specify: \_\_\_\_\_

D5. What is the main material for the floor covering? \_\_\_\_\_  
1=Cement, 2=Mud, 3=Mixture of cement and mud, 4=Other, Specify: \_\_\_\_\_

D6. How many rooms does your household occupy in this dwelling? \_\_\_\_\_  
(Include Living and Dining Rooms, Bedrooms - But Exclude Kitchens, Bathrooms, Toilets, Passages)

D7. What is the primary source of water used most often in this household for drinking?  
\_\_\_\_\_ 1=Tap in house, 2=Public tap, 3=Open water (e.g. spring, river, lake), 4=Borehole, 5=Bottled  
6=Other, Specify: \_\_\_\_\_

D8. What kind of toilet facilities does the household have? \_\_\_\_\_  
1=Flush toilet, 2=Latrine (includes KVIP), 3=Other, Specify: \_\_\_\_\_

D9. Does the household have electricity? \_\_\_\_\_ 0=No, 1=Yes

D10. What is the main source of energy for cooking? \_\_\_\_\_  
1=Charcoal, 2=Gas, 3=Wood, 4=Kerosene, 5=Other, Specify: \_\_\_\_\_

## **E. Feeding Practices**

*Adapted from: World Health Organization Indicators for assessing infant and young child feeding practices: Part 2 Measurement, 2010*

### **I would like to ask you some questions about your child.**

E1. Was your child breastfed yesterday during the day or at night? \_\_\_\_  
0=No, 1=Yes, 8=Don't know

If E1=1 (Yes) → Go to E4

If E1=0 (No) or 8 (Don't know) → Go to E2

E2. Has your child ever been breastfed? \_\_\_\_ 0=No, 1=Yes, 8=Don't know

If E2=1 (Yes) → Go to E3

If E2=0 (No) or 8 (Don't know) → Go to E4

E3. How old was your child when you stopped breastfeeding (months)? \_\_\_\_

### **Next I would like to ask you about some liquids that your child may have had yesterday during the day or at night.**

E4. Did your child have any:

0=No, 1=Yes, 8=Don't know; Record 98 if don't know number of times

a. Infant formula? \_\_\_\_

If E4a=1 (Yes):

Number of times: \_\_\_\_

Type of formula: \_\_\_\_

1=SMA, 2=Lactogen, 3=Similac, 4=Other, Specify: \_\_\_\_\_

b. Milk such as tinned, powdered, or fresh animal? \_\_\_\_

If E4b=1 (Yes):

Number of times: \_\_\_\_

c. Yogurt? \_\_\_\_

If E4c=1 (Yes):

Number of times: \_\_\_\_

E5. List recall

**Now I would like to ask you about (other) liquids or foods that your child ate yesterday during the day or at night. I am interested in whether your child had the item even if it was combined with other foods. For example, if your child ate a millet porridge made with a mixed vegetable sauce, you should reply yes to any food I ask about that was an ingredient in the porridge or sauce. Please do not include any food used in a small amount for seasoning or condiments (like chilies, spices, or herbs), I will ask about those foods separately.**

OTHER FOODS: Please write down other foods in this box that respondent mentioned but are not in the list below:

Yesterday during the day or at night, did your child drink or eat:

No.	QUESTIONS & FILTERS	Y	N	DK
A	Bread, koko, rice, noodles, or other foods made from grains, including grain-based porridge?	1	0	8
B	White potatoes, white yams, cocoyam, cassava, plantain, or any other foods made from roots?	1	0	8
C	Carrots, squash, or sweet potatoes that are yellow or orange inside?	1	0	8
D	Any dark green leafy vegetables? e.g. kontomire	1	0	8
E	Ripe mangoes or pawpaw?	1	0	8
F	Any other fruits or vegetables? e.g. banana, orange, or tomatoes	1	0	8
G	Liver, kidney, heart, or other organ meats?	1	0	8
H	Any meat, such as beef, pork, lamb, goat, chicken, or duck?	1	0	8
I	Eggs?	1	0	8
J	Fish powder?	1	0	8
K	Fresh, dried or smoked fish, shellfish, or seafood?	1	0	8
L	Any foods made from beans, soyabean, peas, lentils, groundnuts or other nuts?	1	0	8
M	Cheese, yogurt, or other milk products?	1	0	8
N	Any oil, fats, or butter, or foods made with any of these?	1	0	8
O	Any sugary foods such as chocolates, sweets, candies, pastries, cakes, or biscuits?	1	0	8
P	Condiments for flavor, such as chilies, spices, or herbs? e.g. maggi, shito	1	0	8
Q	Foods made with red palm oil or red palm nut pulp sauce?	1	0	8
R	Any other solid or semi-solid food?	1	0	8

Check that a response is circled for each question.

If all are NO → Go to E6

If at least one YES or all DON'T KNOW → Go to E7

E6. Did your child eat any solid, semi-solid, or soft foods yesterday during the day or at night? \_\_\_\_ 0=No, 1=Yes, 8=Don't know

If E6=1 (Yes) → Ask what foods, circle it in list or write in box THEN Go to E7

If E6=0 (No) or 8 (Don't know) → Go to E8

E7. How many times did your child eat solid, semi-solid, or soft foods other than liquids or breast milk yesterday during the day or night? Number of times: \_\_\_\_ Record 98 if Don't know

**Now I would like to ask you about some particular foods your child may eat. I am interested in whether your child had the item even if it was combined with other foods.**

E8. Yesterday, during the day or night, did your child consume any Cerelac? \_\_\_\_  
0=No, 1=Yes, 8=Don't know

**The last question I would like to ask is about the kind of salt you use most often at home for cooking and adding to foods.**

E9. Do you use iodated salt like Annapurna most often at home? \_\_\_\_  
0=No, 1=Yes, 8=Don't know

## F. Child's anthropometric measurements

Interviewer 1: \_\_ \_\_

Interviewer 2: \_\_ \_\_

Sex:

(1=Male, 2=Female)

Date of birth:

(DD-MMM-YY)

\_\_ \_\_ / \_\_ \_\_ \_\_ / \_\_ \_\_

Age in months:

<input type="text"/>	<input type="text"/>
----------------------	----------------------

Source of information:

(1=Health card, 2=Mother)

Weight (kg):

intv1	
<input type="text"/>	<input type="text"/>

 . 

intv2	
<input type="text"/>	<input type="text"/>

 . 

Length (cm):

<input type="text"/>	<input type="text"/>	<input type="text"/>
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 . 

<input type="text"/>	<input type="text"/>	<input type="text"/>
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Observations:

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## **Appendix 3: Interview procedures and guides**

### **Focus Group - Procedures**

#### **1) Invite women with children 6-23 months of age to participate**

You are invited to participate in a group interview. The purpose of this meeting is to discuss your experiences with the microcredit program and how it has influenced the well-being of you and your children. This meeting is also to find out about the information you have received about nutrition and child feeding from any sources such as in health clinics or from family and friends. This information will help the people who plan microcredit programs understand more about the benefits of providing nutrition education to improve your knowledge and the health and nutrition of your children.

*Explain consent form in detail and have all mothers who would like to participate sign forms.*

#### **2) Welcome and Introductions**

Thank you all for taking the time to attend this meeting.

Introduce moderators. Meet and introduce the person beside you (name, infant's age/name, hobbies/work) OR song/dance.

#### **3) Review Ground Rules**

A series of questions will be asked and each question will be followed by discussions. Please feel free to express yourself, while also allowing everyone to have their turn. During your turn, you may respond directly to the question or to someone else's comment, while maintaining respect for the opinions of others. You may also choose not to answer. Please take your time to respond and ask for clarifications at any time. Each of your opinions is important to the study. So please feel free to express your own views, even if they differ from those of other members of the group. At the end, we will review what has been said to make sure that we understand your opinions.

#### **4) Questions and Discussions**

#### **5) Wrap-Up**

#### **6) Thank participants for time**

## **Focus Group - Interview Guide**

*Opening – present and past experiences to set context*

1. Would a few of you like to share what a typical day is for you?  
(Ask 2-3 women)

*Experiences – microcredit program*

2. Can you tell me about your experiences with the microcredit program?

*Probes*

- ◆ How long have you been a part of it?
- ◆ Why did you join?
- ◆ What do you like about it?
- ◆ Has it helped you? In what ways?
- ◆ How do you select women to be in your group?

*Knowledge, opinions – nutrition*

3. Can you tell me about any specific information or messages you have received in the past about infant and young child feeding? (Specifically for children 6-23 months)

*Probes*

- ◆ Breastfeeding?
- ◆ When to introduce foods?
- ◆ Choice of foods? How much? How often?
- ◆ Other?

4. When and where did you receive this information? From who?

*Probes*

- ◆ Health clinics, hospitals
- ◆ Family and friends
- ◆ Radio/Television
- ◆ Church, prayer camps
- ◆ Bank
- ◆ Other sources

5. Which source of information do you trust the most? Why?

*Experiences, opinions – feeding practices*

6. How do you feed your child?

*Probes*



- ◆ Exclusive breastfeeding? (Did the child ever receive anything else?)
- ◆ When did you introduce foods? What foods? How many times per day? At what age?
- ◆ Why do you do that?

7. What influences how or what you feed your children? In what ways?

*Probes*

- ◆ Family? Friends? Health workers?
- ◆ Income?
- ◆ Food availability/access?

8. What kind of salt do you use at home for cooking and adding to foods? Why?

*Probes*

- ◆ Rock salt? Annapurna? Others?
- ◆ What have you heard about iodated salt?

*Experiences, opinions – microcredit and nutrition*

9. How have the loans changed your overall income?

*Probes*

- ◆ Same, increased, decreased?
- ◆ Ask for specific examples

10. Do you notice a difference in your child's diet because of having the loans?

*Probes*

- ◆ Same, improved, worsened?
- ◆ Ask for specific examples

11. How has being in the microcredit program influenced how or what you feed your children?

*Probes*

- ◆ Ask for very specific examples of what they do now that is different than what they did before having the loan. Examples:
- ◆ Types of foods you purchase now (e.g. street foods)?
- ◆ Types or quality of food you obtain to eat at home?
- ◆ How you choose to cook food (e.g. fry more because you can afford oil)?
- ◆ Etc.

12. Can you tell me about any other ways that the microcredit program has impacted you as an individual? Your child?

*Probes*

- ◆ Ask for examples, scenarios (their own or a friend's)
- ◆ What has this meant to you? What have you gotten out of it?

*Opinions – closing suggestions*

13. Do you have any suggestions about things the bank could do to improve the microcredit program?

*Probes*

- ◆ Anything you dislike?

14. Do you see yourself in the microcredit program forever or is it a stepping stone?

15. Were any of you part of the microcredit program when education lessons were given at meetings 4 years ago? If yes, what did you think of it?

That covers the questions that I wanted to ask. Your comments have been very helpful. Is there anything else that you would like to add? Any questions for me?

Thank you.

***Note:** Questions about the microcredit program were skipped in the focus group with non-microcredit mothers.*

## **Freedom from Hunger - Interview Guide**

*Opening – present and past experiences to set context*

1. Can you tell me about a typical day at work for you?

*Probes*

- ◆ Job title
- ◆ Years working in this position
- ◆ Age
- ◆ From where
- ◆ Language spoken
- ◆ Background, education

*Experiences – nutrition education and microcredit programs*

2. Can you tell me about the activities related to Freedom from Hunger's *Credit with Education* program in Ghana? How has this changed (over the past year, 5 years, 10 years)?

*Probes*

- ◆ What? When? Where? How?
- ◆ Your role in the program?
- ◆ Ask for: Documents (any reports, etc. they will share), Training materials

*Knowledge, experiences – interactions between staff and banks*

3. Who is responsible for teaching the education curriculum to the banks? How are they trained?

*Probes*

- ◆ Training manuals/materials? Language?
- ◆ In-service education?
- ◆ How often?
- ◆ Who gives training?
- ◆ Topics?
- ◆ How are they evaluated?
- ◆ What are the actual teaching practices in the bank?
- ◆ Who, what, when?

4. What is your involvement with the banks after the training?

*Probes*

- ◆ Follow up? Re-training?
- ◆ What are the challenges?
- ◆ Sustainability plan?

*Experiences, opinions – facilitators and barriers to nutrition education*

5. What do you think are the benefits of providing nutrition education to women?
6. In your opinion, what facilitates integrating nutrition education into microcredit programs?
7. What are the barriers/challenges?  
*Probes*
  - ◆ Strategies to overcome these?

*Opinions – closing suggestions*

8. What are your suggestions for making nutrition education sustainable over time in microcredit programs?  
*Probes*
  - ◆ Monitoring? Evaluation?
  - ◆ Refresher training?
  - ◆ Help from other organizations?

That covers the questions that I wanted to ask. Your comments have been very helpful. Is there anything else that you would like to add? Any questions?  
If you think of anything else – contact info.

## **Bank Staff - Interview Guide**

*Opening – present and past experiences to set context*

1. Can you tell me about a typical day at work for you?

*Probes*

- ◆ Job title
- ◆ Years working in this position
- ◆ Age
- ◆ From where
- ◆ Languages spoken
- ◆ Background, education

*Experiences – microcredit program, interactions between bank staff and others*

2. Can you tell me about the microcredit program at the bank?

*Probes*

- ◆ Your role in the program?
- ◆ When did it start? Why?
- ◆ How is it evaluated?
- ◆ Total number of members, average loan size, group size, cycles per group, repayment schedule, etc

3. Who else is involved in the microcredit program?

*Probes*

- ◆ Roles of other bank staff? Health workers? Organizations
  - ◆ Ministry of Agriculture, Ghana Health Services?
- ◆ Impression of others involved
  - ◆ How do they view microcredit?
  - ◆ How is microcredit viewed within the bank itself? By field staff? Importance, value of it, etc.

*Knowledge, experiences – nutrition education*

4. Can you tell me about the nutrition education lessons you have taught in your microcredit program in the past?

*Probes*

- ◆ Language of instruction?
- ◆ What information was taught?
  - ◆ Importance of nutrition among the other topics?
- ◆ When and where did you receive this information?
  - Education (years, type)
  - Training - In-service training (frequency, content)

- Other sources of info (i.e. follow-up courses, reading material, unofficial training)
- ◆ How was this information integrated into the program?
- ◆ Who was trained to deliver the lessons?
- ◆ How often were lessons delivered?
- ◆ How long did you provide the lessons for?
- ◆ When did they stop? Why?
- ◆ Was it evaluated? If so, how? Results?

5. Can you describe a nutrition education session that you have had with a microcredit group?

*Probes*

- ◆ Who? When? How long?
- ◆ What teaching materials were used?
- ◆ How were they received by the women?

6. Does the bank have any future plans to provide nutrition education lessons in the microcredit program again? If yes, what are they?

*Probes*

- ◆ Refresher training courses?
- ◆ View on potential for improving the education lessons?

*Experiences, opinions – Freedom from Hunger, PLAN*

7. Can you tell me about your experiences with Freedom from Hunger? PLAN?

*Probes*

- ◆ Their roles in nutrition education at the bank?
- ◆ When? For how long?
- ◆ Were there any problem areas? Why do you think this might have been?

*Experiences, opinions – facilitators and barriers to nutrition education*

8. In your opinion, what do you think are the benefits of providing nutrition education to women? Is a microcredit group a good venue?

9. In your opinion, what facilitated integrating nutrition education into your microcredit program?

10. What were the barriers/challenges?

*Probes*

- ◆ Strategies to overcome these?

*Opinions – closing suggestions*

11. What are your suggestions for reintegrating nutrition education into your microcredit program successfully and making it sustainable over time?

*Probes*

- ◆ What is needed?
- ◆ Monitoring? Evaluation?
- ◆ Refresher training?
- ◆ Help/support from other organizations? E.g. FFH, GHS

12. What are your future career goals?

*Probes*

- ◆ What do you see yourself doing in 5 years, etc.?

That covers the questions that I wanted to ask. Your comments have been very helpful. Is there anything else that you would like to add? Any questions for me?  
If you think of anything else – contact info.